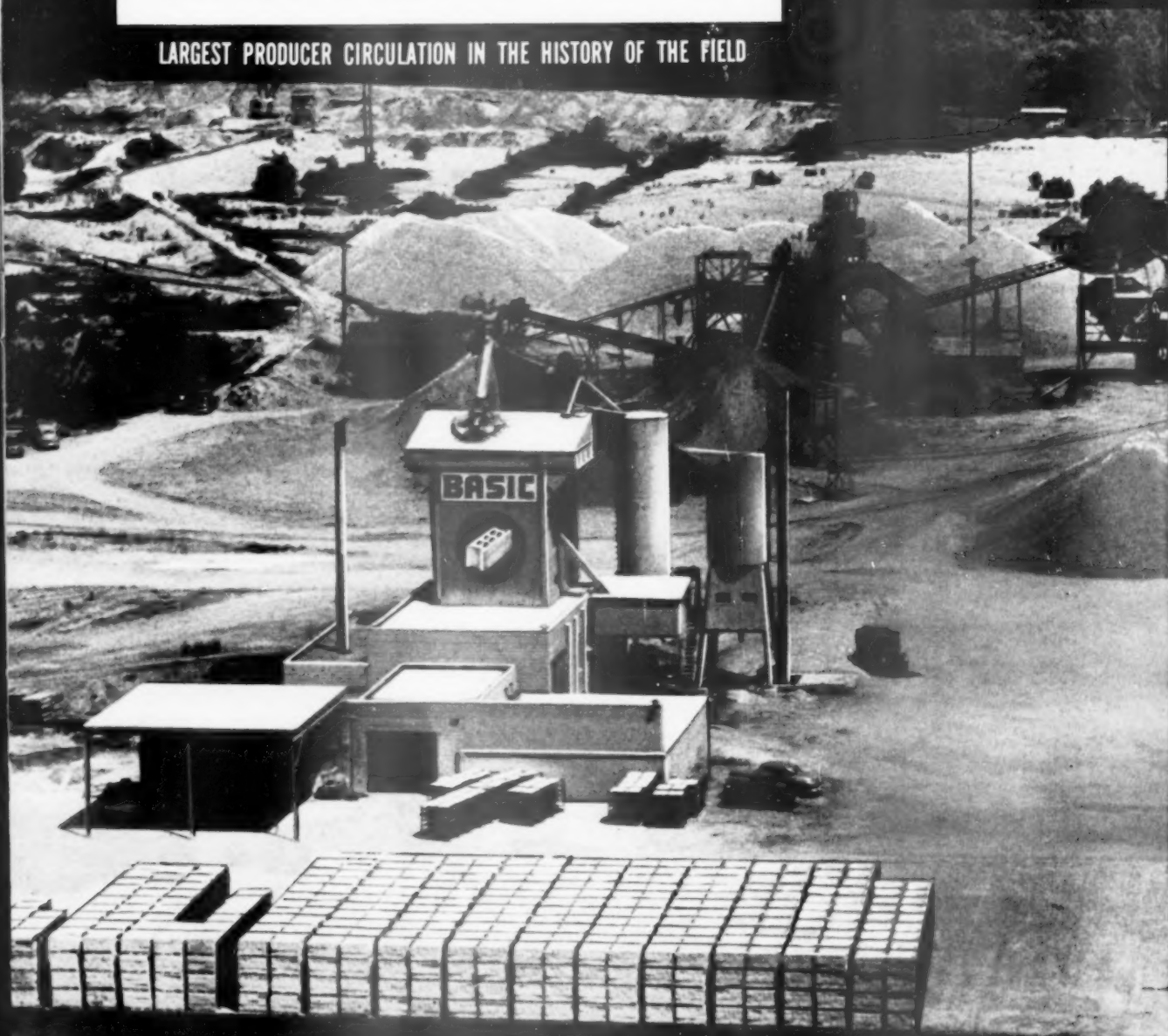


THE INDUSTRY'S RECOGNIZED AUTHORITY

ROCK PRODUCTS

LARGEST PRODUCER CIRCULATION IN THE HISTORY OF THE FIELD



"The most versatile machine we know"

George M. Baker, Lockwood, Mo.



You don't have to take a second look to see that Mr. Baker is referring to a Caterpillar HT4 Shovel. This machine is known everywhere as an all-purpose tool with a specialist's ability, because it handles so many different jobs so well. The rig shown here is loading pulverized limestone on trucks at Caplinger Mills, Mo. Mr. Baker says: "We also use it as a 'dozer, hauler, clean-up and many more things on the job."

Versatility is just one of the many advantages you get when you put a Cat HT4 Shovel to work for you. It's economical to run, burning low-grade, low-cost fuels without fouling. Power and capacity are matched for smooth, easy operation. And it's ruggedly built for long life. For example, its all-welded girder type frame is cross braced for extra strength and mounted close

to the carrier rollers to lessen loads on transmission case and tractor frames. Lift arms are braced to prevent twisting and to keep the bucket level. And the hydraulic system is sealed to keep dust out and oil in. These and other features add up to a machine that's steadily on the job and seldom in the shop!

Your nearby Caterpillar Dealer is a reliable source of information and service. Get the full facts about this versatile, money-saving unit from him. Ask for a demonstration—he'll be glad to arrange one for you!

CATERPILLAR, PEORIA, ILLINOIS

CATERPILLAR

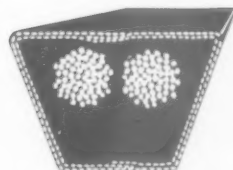
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TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT**

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**B. F. GOODRICH
GROMMET V BELT**

Where failures meant shutdowns they changed to grommet belts

B. F. Goodrich grommet V belts last 20 to 50% longer

Crushing rock puts terrific shock loads on the V belts that drive the crusher. When the drive stops because of premature belt failure, the whole operation shuts down, deliveries are delayed. The stone company wanted reliability—and got it—when a set of B. F. Goodrich grommet V belts was installed. In spite of the shaking, jolting action, the grommet V belts on this crusher have already given two years of trouble-free service, and are still in excellent condition. Here's why B. F. Goodrich grommet V belts outlast and outperform ordinary belts.

No cord ends

A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord

section in a grommet V belt eliminates such failures.

Concentrated cord strength

All of the cord material in a B. F. Goodrich grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. There are no layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced. And grommet V belts stretch less—only $\frac{1}{3}$ as much, on an average, as ordinary V belts.

Better grip, less slip

Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give $\frac{1}{3}$ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

They cost no more

Grommet V belts cut costs because they last longer, increase production because machines keep running with fewer interruptions, reduce maintenance costs because they need less attention, yet they cost not one cent more. Available in C, D and E sections. But remember, only B. F. Goodrich makes the grommet V belt (U. S. Patent No. 2,233,294), so to get all these savings, call in your local BFG distributor the next time you need V belts, or write The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio. (Available in Canada)

Grommet V-Belts BY
B.F. Goodrich
RUBBER FOR INDUSTRY



ROCK PRODUCTS



FEBRUARY, 1953

THE INDUSTRY'S RECOGNIZED AUTHORITY

VOL. 56, No. 2

Bror Nordberg
Editor

Nathan C. Rockwood
Editorial Consultant

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HERE'S the kind of digging that tests equipment. Here's where the smooth dipper action, that comes with the Northwest Dual Independent Crowd, pays off. Here's where ease of operation, freedom from jockeying to spot the load, and easy crawler action combine for output. These are the advantages you get with the "Feather-Touch" Clutch Control, Uniform Pressure Swing Clutches and Northwest steering. These are the advantages that McDonough Brothers, Inc., found in their first Northwest — advantages that have increased with their new Northwest.

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on a 25-hp tractor
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Have your nearby Le Roi distributor tell you *all* the reasons why it pays to use the Le Roi-CLEVELAND T286 Self-Propelled Dual Drill Rig. Write for Bulletin RD-21.

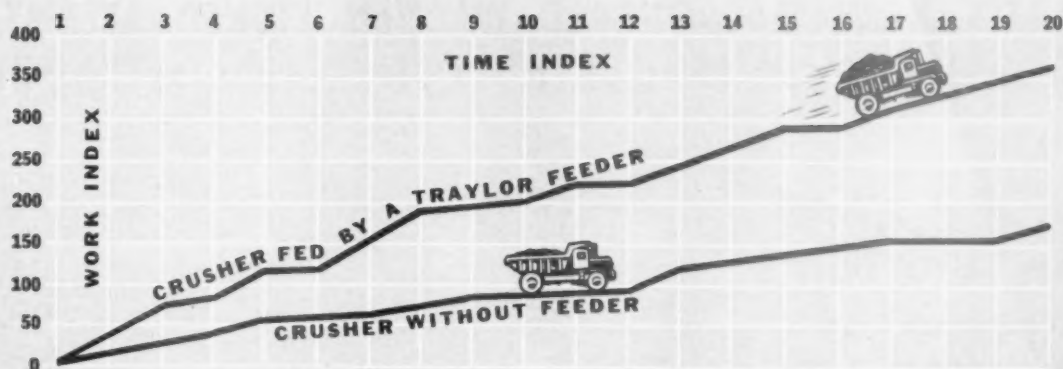


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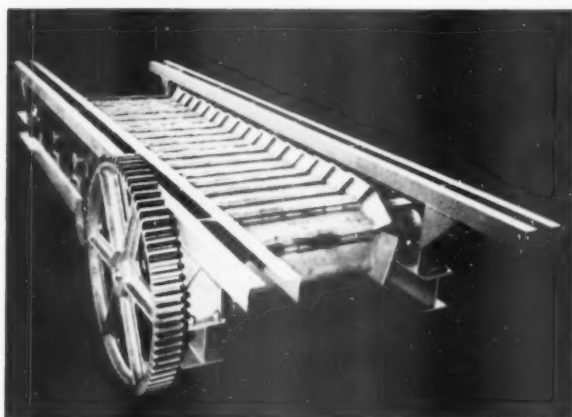


You take the High Road

This chart, based on actual job records, clearly shows that a crusher evenly fed by a Traylor Apron Feeder more than doubles its production. That's because there are no peaks and valleys in the material supply.

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Any crusher is more efficient when working with a controlled flow of material. Unnecessary wear from shock loading is practically eliminated . . . down time is reduced . . . production is increased. Traylor Apron Feeders are built with overlapping, heavy steel aprons and flanges which present a solid surface . . . prevent material leakage. Widths from 30" to 84" in any practical length. Coupon brings illustrated Bulletin with complete information. Send for your copy today.

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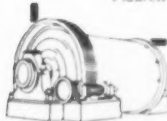
Primary Gyratory Crushers



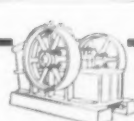
Rotary Kilns



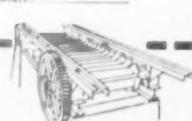
Secondary Gyratory Crushers



Ball Mills



Jaw Crushers



Apron Feeders

HERE'S HOW MACDOUGALD-WARREN LICKED ATLANTA'S GROWING PAINS AND KEPT CONCRETE COSTS DOWN

They Solved Their Problem with an ERIE PORTABLE TRUCK MIXER PLANT and Gained an Important Advantage



MACDOUGALD-WARREN'S . . . ERIE PORTABLE TRUCK MIXER PLANT GTS-79 WITH 600 BBL. GROUND SILO

Atlanta's development and growth program posed a problem for MacDougald-Warren, one of the South's ready-mix operators. Much of the construction is in the newer parts of town, away from MacDougald-Warren's central location. This meant long hauls . . . fewer trips . . . higher costs.

An Erie Portable Truck Mixer Plant licked this time-cost problem and gave MacDougald-Warren an important advantage to boot.

Said Mr. Edward Kelley, "Our Erie truck mixer is portable and also gives us central plant capacity. In one run it averaged 60 yards for nine hours straight. We'll use our Erie Portable here in Atlanta and on jobs throughout the south."

This installation is only one of hundreds where an Erie unit is helping to beat a time-cost problem. It can do as much for you. We invite you to consider and field test our equipment.

More Facts About Erie's GTS-79 Portable Truck Mixing Plant

One man can operate this unit at full capacity.

It's pre-assembled into large sections which make set-up and take down fast and easy. Stows compactly for over-the-road transit too.

Phone or write for Booklet GS, Dept. P

ERIE

STEEL CONSTRUCTION COMPANY

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LeTourneau pictures of the month . . .



MINES IRON AT 30° BELOW — 215 miles north of the Arctic Circle at Kirkenes, Norway, 2 C Tournatractors work 24 hours a day, 365 days per year. Their task, vital to the Norwegian defense effort, includes shovel clean-up and haul road maintenance in one of the largest open magnetite pits in Scandinavia. Some 2,300,000 tons of ore are being removed annually

The pit is 350 ft deep. Despite the grades, subzero arctic weather and abrasive material, Tournatractor efficiency has been very high. Rig's tires have required no repair. Greasing, required only once every 10 shifts, can be done in about 15 minutes. Overall maintenance needs are low. Equipment owner is Sydvaranger A/S of Oslo, leading European contracting firm.



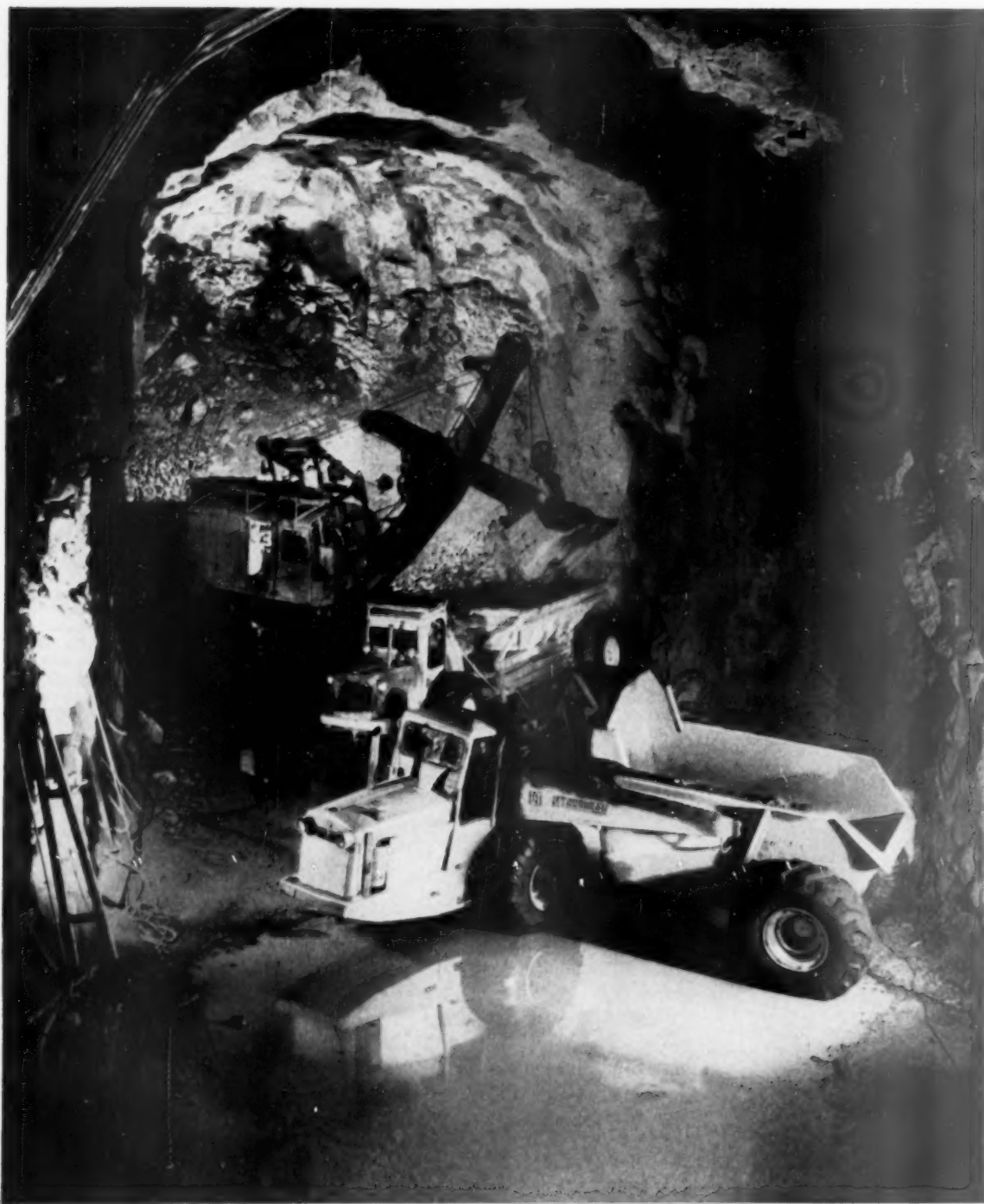
CARRIES 50 TONS PER LOAD — Here hard at work in the Pennsylvania anthracite fields is one of Colitz Coal Co.'s three 50-ton Tournarockers. Behind a 450 hp butane engine, these rigs carry 41 pay yards per load. They are 36 ft

long overall, yet turn in a radius of 15 ft 8 in. With Tournarockers, you can forget many of your old rear-dump troubles. These rigs have no frame, sub-frame, springs, tie rods, or hydraulics. Electric push-buttons control steer, dump, shift.

(Advertisement)

See next page

LeTourneau pictures of the month (cont'd.) . . .



DIG 2.9-MILE TUNNEL THROUGH SOLID ROCK

These rigs are not toys. That's a $2\frac{1}{4}$ -yd shovel, loading one of six 18-ton LeTourneau haul units used on this job. They are digging a sloping 2.9-mile-long, 40-ft high tunnel through tough, sharply-fragmented gneiss-type rock to connect two lakes in Sweden. The fall of water through the tunnel from one lake to the other will provide electrical power. Tunnel is only 36 ft wide, yet Tournarockers turn around easily in one continuous sweep. Loads

average 18 tons each. Production averages 36 tons hourly over typical $2\frac{1}{4}$ -mile cycles. Digging is so tough that only 20 lineal ft of tunnel is opened per day. "In spite of severe conditions, repair and maintenance costs have been very low," says S. Westby, chief engineer on the 785,000-yd project, one of the largest ever contracted in Sweden. "Tournarocker's greatest advantage is its maneuverability and short 13 ft 9 in. turning radius."

(Advertisement)

Performance reports on LeT equipment in action



HUNTS OIL IN 150° HEAT — 250 miles from the nearest oasis, this Tornadozer is really getting a rough workout. Used by the Iraq Petroleum Co. exploration crews in eastern Arabia, it prepares drill locations, levels camp sites, and builds haul roads. Rig works 10 to 18 hrs a day in temperatures which hit 150° in the daytime, then drop to 35° at night. Material is mostly desert sand with occasional outcroppings of coral and sandstone. Only servicing required in the past year has been routine weekly inspections.



MINES SHALE IN TEXAS — By mining 250 tons of slacked shale daily with their self-loading D Tournapull, Acme Brick Co., Fort Worth, Tex., cut man-hour requirements 75%. Single "D" replaces a dump-truck and front-end loader. It handles in 4¼ hrs the same job that formerly took 17 man-hrs to complete. "D" self-loads 5 bank yds of shale, hauls 0.4 mile to crusher bin, dumps and returns to pit in 4.5 min. Performance here led to purchase of 3 more units for other Acme pits in Melvern, Ark, Clinton, Okla, and Baton Rouge, La.



DRIVES 755 MI IN 34 HRS — Rogelio Viesca, Mexico City contractor, recently took his rubber-tired Tournapulls on a long journey. Rigs drove over paved highways, through cities and towns, and across 8,000-ft mountains to reach Mexico City from Laredo, Texas. They made the 755-mi trip in 34 hrs, total driving time (an average of 22 miles an hour) . . . went to work on construction of a new spur line for Pemex Oil Co. the day they arrived at the job site.



WORKS UNDER WATER — Tournapull wades across 5-ft river on the way from Panama City to Pan American Highway job near David on the Costa Rican border. Though water covered generator, rig's electric controls were not affected, reports Owners Vallarino & Arias. That's nothing unusual, though. Water never stops the LeTourneau electric motors or generator. One motor, operated under-water for 4 yrs as a test, still runs as well as ever.

See next page



(Advertisement)

LeTourneau pictures of the month (cont'd.) . . .



6000 HRS, 90% EFFICIENT — All feeding for this portable asphalt plant, run by Miss. State Highway Dept at Hattiesburg, is handled by Tournatractor. Plant output averages 770 tons per 9-hr day. After 3½ yrs (over 6,000 hrs)

work in sand and gravel, rig has been 90% efficient . . . still has original tires. "Haven't had a minute's trouble with them," says Plant Supt Grady McCardle. Tracks would have needed at least 5 or 6 complete overhauls during same period.



7 JOBS IN 10 HRS — In Minn the Coons Co. handles scattered jobs with Tournatractor. In a typical 10-hr shift, rig maintains 2 overburden dumps, stockpiles lean ore, cleans up for 3 shovels, maintains haul roads.



BEATS WINTER SHUTDOWN — Frank Whitcomb works his 2 rear-dump Tournarockers 12 months a year. In New Hampshire, where he does most of his work, temperatures often drop well below zero. But no matter how cold it gets, Tournarockers dump any material that can be loaded. Electrical induction body heating keeps loads from freezing. When unheated trucks have to be used under similar cold weather conditions, they must be cleaned out by a small pull shovel.



3½-MINUTE MILE — Lehigh Portland Cement Co, Albany, NY, uses this D Tournarocker to haul waste. Unit loads 12 yds, hauls 1 mi to dump in 3½ min. With front-wheel drive, Tournarocker backs safely to edge, dumps clear over bank. Saves expensive cleanup.



"VERY FAST AROUND A SHOVEL" — Stripping year-round for Diamond Portland Cement Co, Ohio, Tournatractor breaks up and dozes 15 to 18" of shale to shovel. As needed for cleanup, machine runs 3 miles to plant or drives into pit for shovel service. Operator Elon Gallineau says, "This machine is dynamite!" Plant Mgr E. R. Evans says, "Rig will move as much shale in half a day as our crawler can in a full day."

R. G. LeTOURNEAU, INC., PEORIA, ILL.

(Advertisement)

Tournatractor—Trademark Tournarocker, Tournapull—Trademark Reg. U. S. Pat. Off. Pic. 310-M



Cut mill operating expenses to the bone!

Install longer-lasting U-S-S LORAIN ROLLED PLATE LININGS...

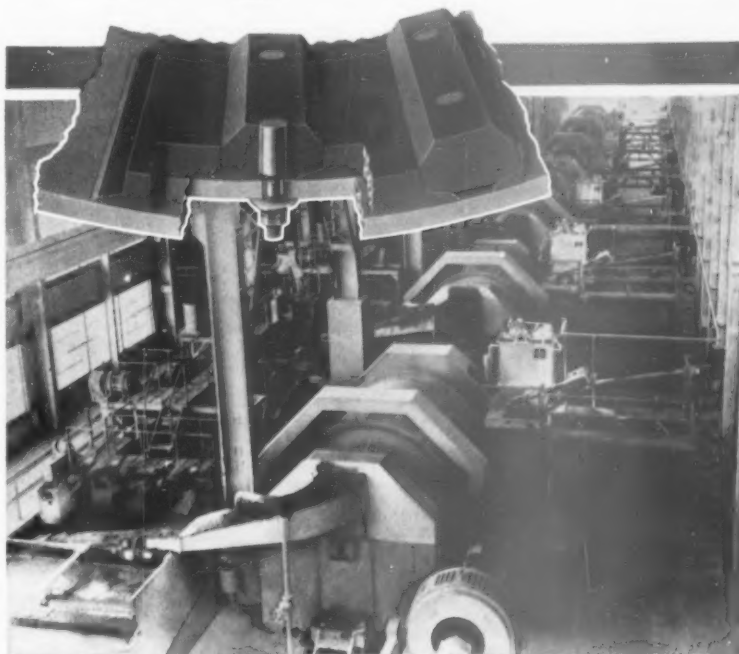
Save on every ton you grind!

NO matter what you grind, U-S-S Lorain Rolled Plate Linings will produce better grinding results, more economically. They're made in easy-to-handle sections that save hours of installation time. They keep mill down-time to a minimum. They're so rugged they'll wear 'til they're paper thin without failing!

Made from top-grade rolled steel, Lorain Linings have far greater wearing life than regular cast linings. Their outstanding strength makes possible the use of thinner sections, saves first cost of metal . . . increases usable diameter of the mill, boosts output. The tight joints between ends of plates and close fit between plates and lift bars eliminate shell wash and allied troubles.

The Liner Plates of Lorain Linings are made symmetrical and interchangeable. Severe localized wear at feed or discharge end can be balanced by heat-treating. The Lift Bars, carefully designed to insure correct cascade action, are available in different lift heights to suit conditions. Lift height will remain approximately constant for life of the lining.

U-S-S Lorain Rolled Plate Linings are available—in the diameter, length and thickness best suited to your operating conditions—through leading mill manufacturers whose names will be furnished upon request.



Installation shows seven Allis-Chalmers' 10'2" x 11' Ball Mills.



U-S-S GRINDING BALLS make better, more economical grinding doubly sure. Available in sizes from $\frac{3}{4}$ " to 5" in diameter. For further information just return this coupon.

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U-S-S LORAIN ROLLED PLATE LININGS AND U-S-S GRINDING BALLS



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UNITED STATES STEEL

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WHEN YOU THINK CRUSHING AND SCREENING

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vote every effort toward designing types and sizes of equipment to meet your specific requirements at the low operating and maintenance costs that give you a definite advantage in competitive bidding as well as a comfortable profit.

Whether your next job is large or small, easy or difficult, it will pay you to get complete details about the Cedarapids equipment that helps you *think big*. Your Cedarapids distributor will gladly recommend the equipment that gets the best results for you, at the lowest cost . . . call him today for facts and figures.

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U.S.A.

BIG PERFORMANCE



The Cedarapids "Rock-It" is a two-in-one unit that reduces 22" stone down to road stone or aglime in one operation. Capacity? Aurora Limestone Products, of Aurora, Iowa, averaged a consistent 100 tons per hour on a 50,000 ton road stone job. Their "Rock-It" has produced 100 tons per hour and also 120 tons per hour on different jobs to keep well ahead of schedule.

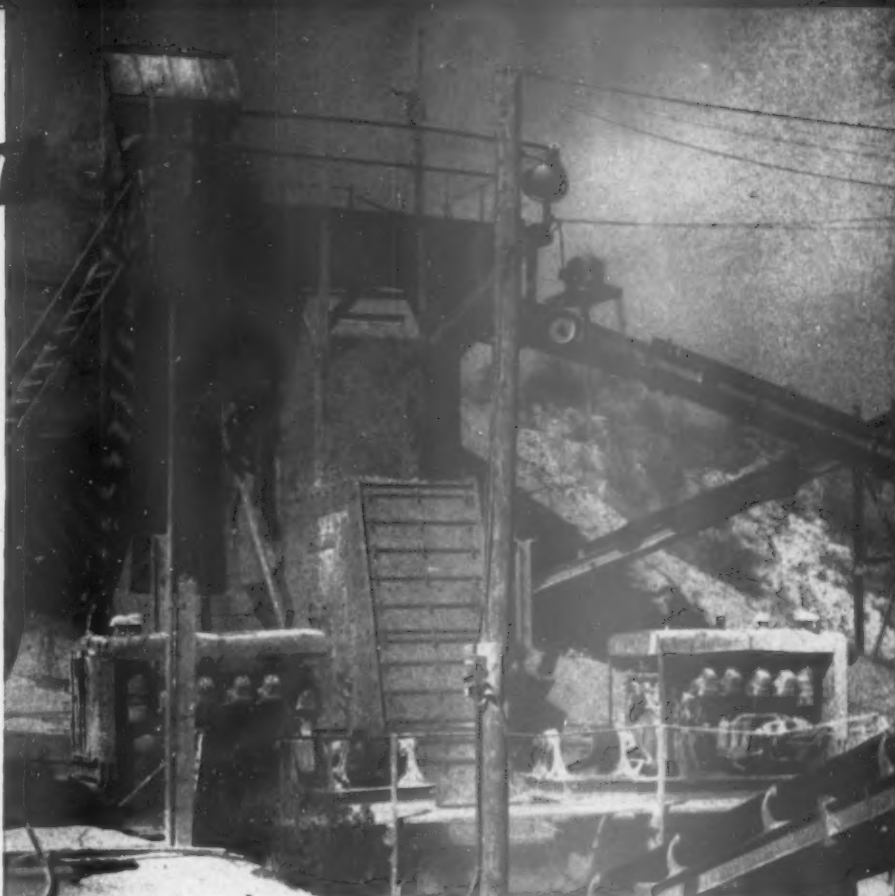
For crushing gravel, "Rock-It" Plants are now available with a 3018 Roll Crusher, in place of the 3033 or 2033 Hammermill, if desired. Your Cedarapids distributor can help you select the right crusher for your requirements.

BIG PRODUCTION

Cedarapids Double Impeller Impact Breakers can't be beat when it comes to hanging up tremendous daily tonnage records. Concrete Materials and Construction Company, using a Model 5050, averaged 600 tons per hour and hit a peak day's production record of 14,472 tons on their New Jersey Turnpike contract.

Using a Model 2020, Western Indiana Gravel Company worked an "impossible" pit and made money. Their problem was to produce gravel with 75% crushed particles in a pit containing 19% soft stone, several seams of conglomerate, with most of the gravel in the 1" to 1½" range, and very little plus 5".

For big volume of cubical shaped aggregate, for extremely low-cost operation, and for profitable production under tough conditions, be sure you investigate the advantages of Double Impeller Impact Breakers. Ask about the new portable plant.



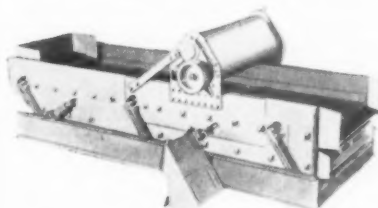
BIG PROFIT

Ask Reno Construction Company about Cedarapids Unitized Plants... they own six of them! They can depend on average hourly production of 150 tons from each plant... or they can combine the four basic units of the Unitized Plants in a number of different ways to meet specifications for every size products on other jobs.

Talk to B. L. Anderson of Cedar Rapids, Iowa. One of his three Unitized Plants is turning out 4 products at a time at a 210 ton per hour clip. That's "thinking big" about production.

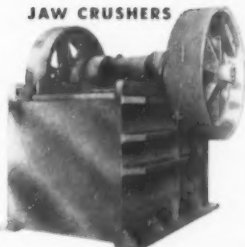


HORIZONTAL VIBRATING SCREENS



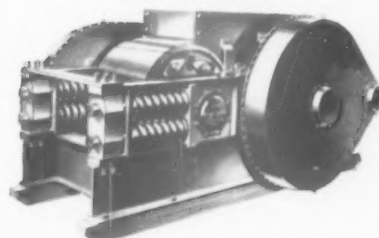
More efficient horizontal screening action, highly accurate gradation and large capacity combine to give you faster and more profitable screening at lower cost. Sizes range from 3' x 8' to 4' x 14' in double or triple deck styles.

JAW CRUSHERS

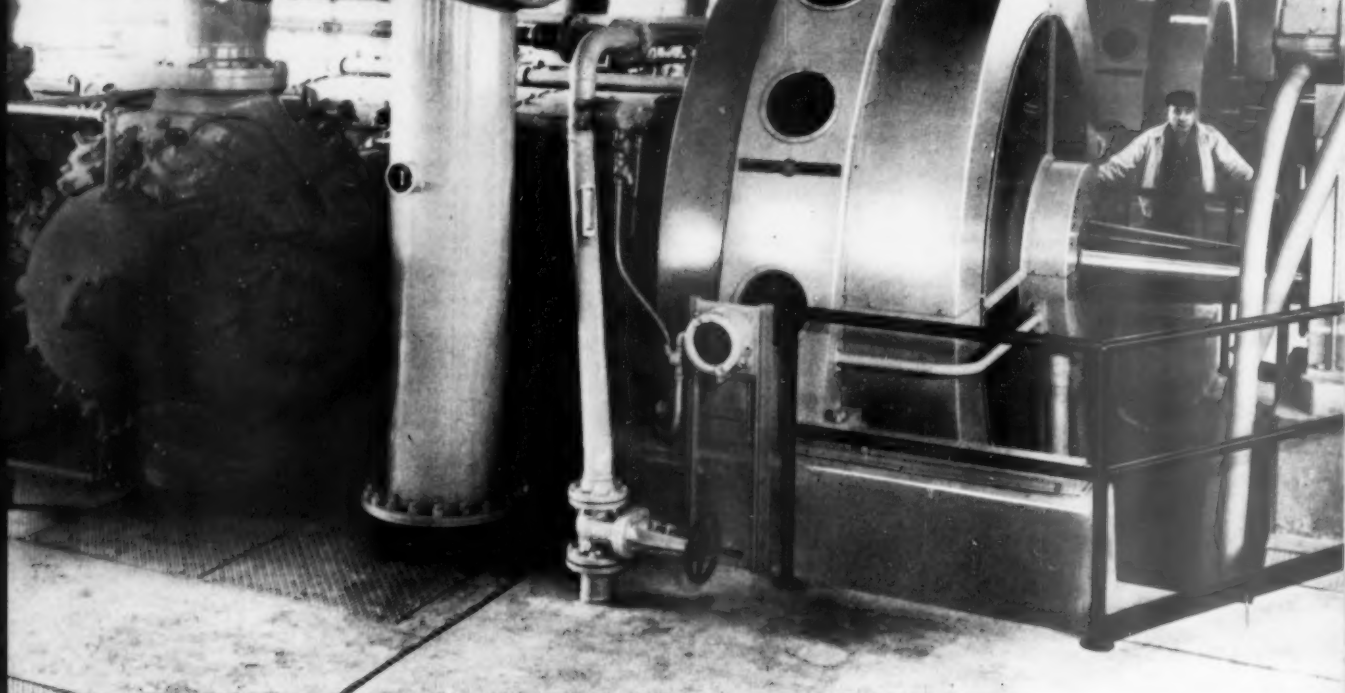


They're built to handle the toughest rock without pampering and produce up to 500 tons per hour at low cost! Available in 6" x 12" to 32" x 40" sizes in plain or roller bearing models. Ask about Twin Jaw Crushers for even higher capacities.

ROLL CRUSHERS

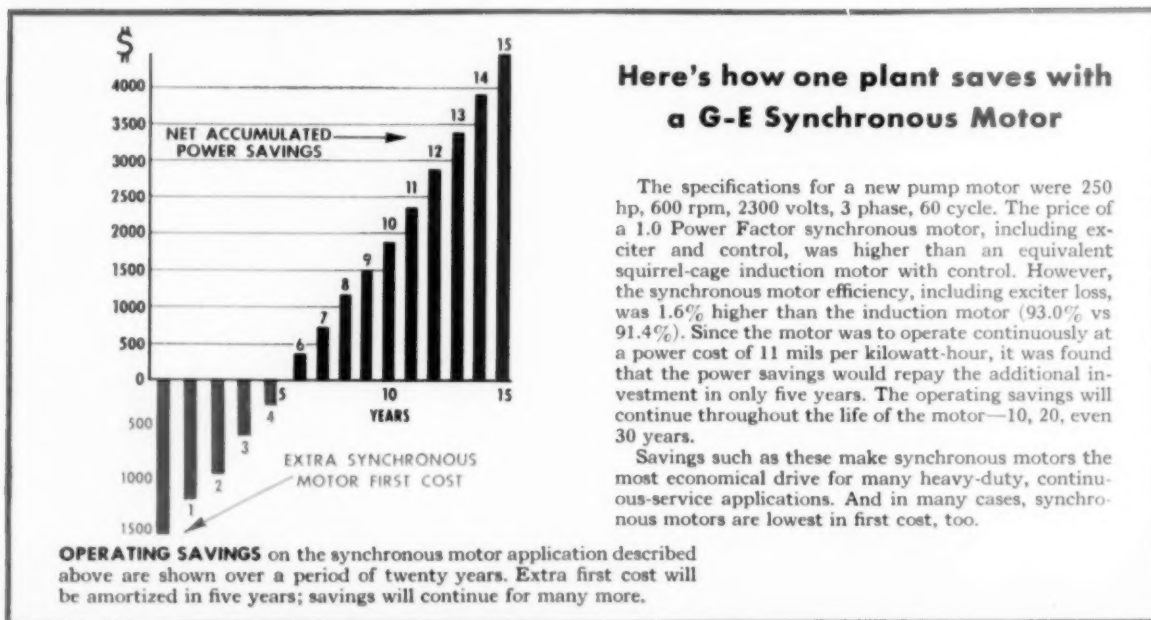


Here are the ideal units for producing a large volume of smaller sized aggregates. Seven sizes (from 16" x 16" to 40" x 24") available with two smooth or two corrugated roll shells, or one of each, depending on the product desired.



COMPRESSORS IN A GAS STORAGE STATION are driven by General Electric 3000 hp, 300 rpm synchronous motors.

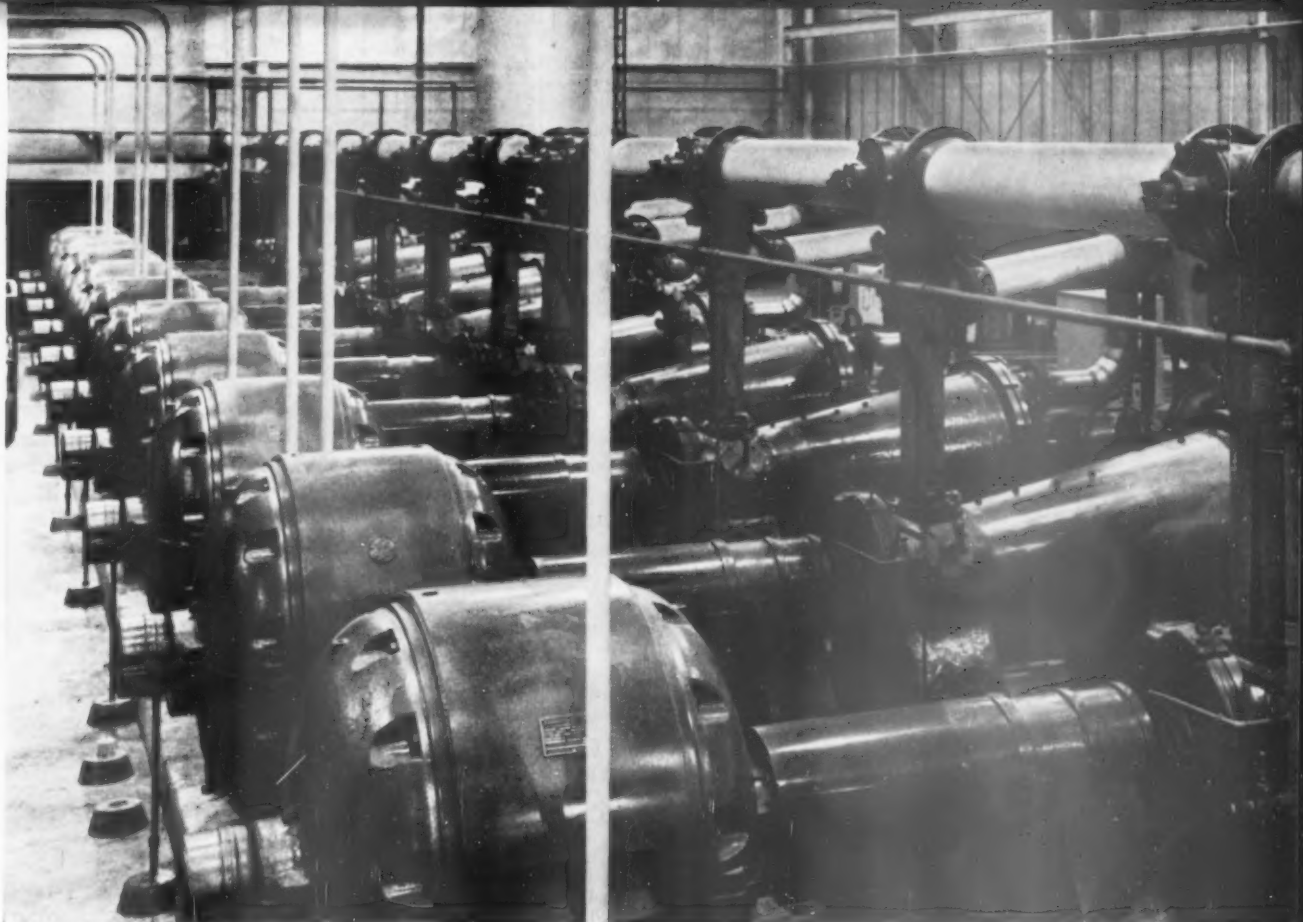
Can synchronous motors cut



Here's how one plant saves with a G-E Synchronous Motor

The specifications for a new pump motor were 250 hp, 600 rpm, 2300 volts, 3 phase, 60 cycle. The price of a 1.0 Power Factor synchronous motor, including exciter and control, was higher than an equivalent squirrel-cage induction motor with control. However, the synchronous motor efficiency, including exciter loss, was 1.6% higher than the induction motor (93.0% vs 91.4%). Since the motor was to operate continuously at a power cost of 11 mills per kilowatt-hour, it was found that the power savings would repay the additional investment in only five years. The operating savings will continue throughout the life of the motor—10, 20, even 30 years.

Savings such as these make synchronous motors the most economical drive for many heavy-duty, continuous-service applications. And in many cases, synchronous motors are lowest in first cost, too.



GENERAL ELECTRIC 400 HP SYNCHRONOUS MOTORS are coupled to ten Jordans in a paper mill.

your plant's operating costs?

Greater Efficiency on Large, Constant-Speed Applications Can Lower Power Costs Substantially

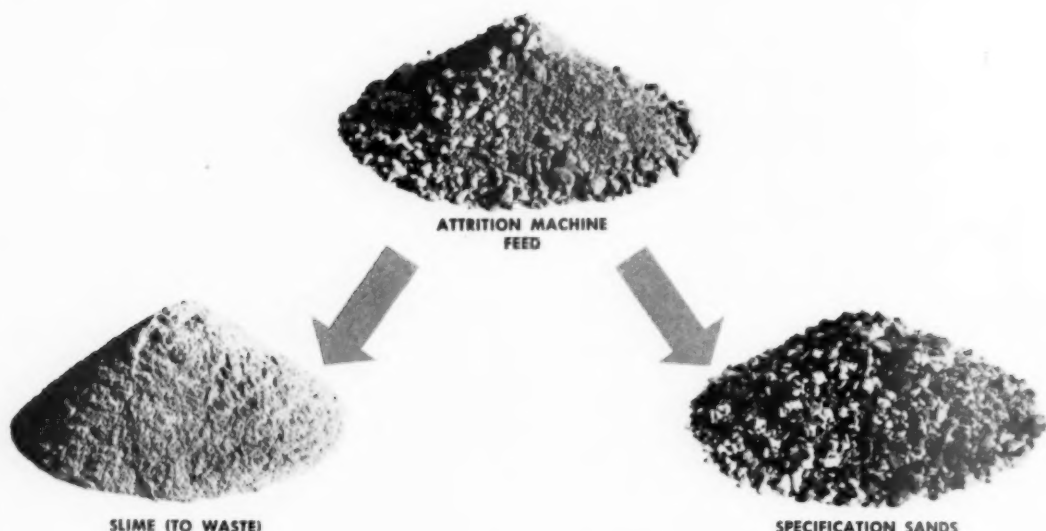
On certain applications selection of General Electric synchronous motors can bring about substantial savings in plant operating costs. Synchronous motors usually have a higher full-load efficiency than any other type of motor, produce more work per dollar's worth of power consumed.

Furthermore, synchronous motors may be able to improve plant power factor—the ratio of total kilowatt load to total kva load. When these two fall out of balance, high system losses, high power bills, or increased maintenance costs commonly result. Using a *unity power factor* synchronous motor adds only to total kw load. And, a *leading power factor* synchronous motor will actually supply reactive kva's to your

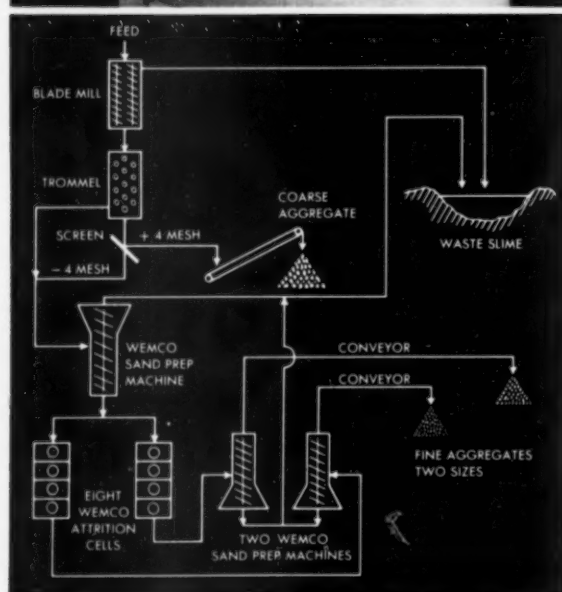
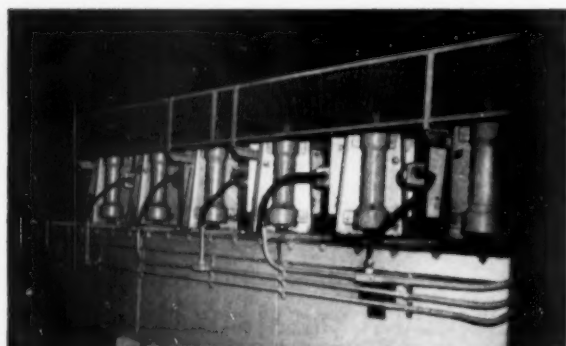
system, while operating at its normal rated output.

Before you select a drive for a large piece of equipment providing heavy and continuous service, be sure to investigate the economics of General Electric synchronous motors. Call in your G-E representative—he'll be glad to discuss your situation with you. Also, information on G-E synchronous motors and their application is available in the following bulletins: GEA-5332, "Low-Speed Synchronous Motors;" GEA-5426, "High-Speed Synchronous Motors;" GEA-5817, "Plant Power Factor Improved With G-E Synchronous Motors." Write to Section 770 27, General Electric Company, Schenectady 5, N. Y.

GENERAL  ELECTRIC



If you have a clay problem— Here's Proof of how **WEMCO** ATTRITION MACHINES break down cemented materials



The above photographs clearly illustrate how the Wemco Attrition Machine removes clay cementing material from sand particles in the plant of a California aggregate producer. With ordinary scrubbing methods this producer was unable to break down the cementing material present in order to meet State aggregate specifications. After installation of Wemco Attrition Machines, this operator was able to scrub loose the cementing material and then remove it by desliming. Note the clean, sharp sand particles produced in the process. The result was a higher profit aggregate of greatly improved quality which fully complied with State specifications.

◀ The Wemco Attrition Machine is a new and more efficient method of washing sand particle surfaces by controlled turbulence of high density pulps. Its thorough abrading action literally scrubs the clay from sand particles more completely than methods formerly used and permits the recovery of clean aggregates for marketing.

◀ Flowsheet of aggregate plant shows use of eight Wemco Attrition Machines in conjunction with two No. 48 Wemco Sand Preparation Machines. Previous to installation, operator was unable to meet fine aggregate specifications.

WRITE WEMCO TODAY for further information on how Wemco Attrition Machines can improve your aggregate operations. Wemco facilities are available for attrition tests on your samples, if desired.

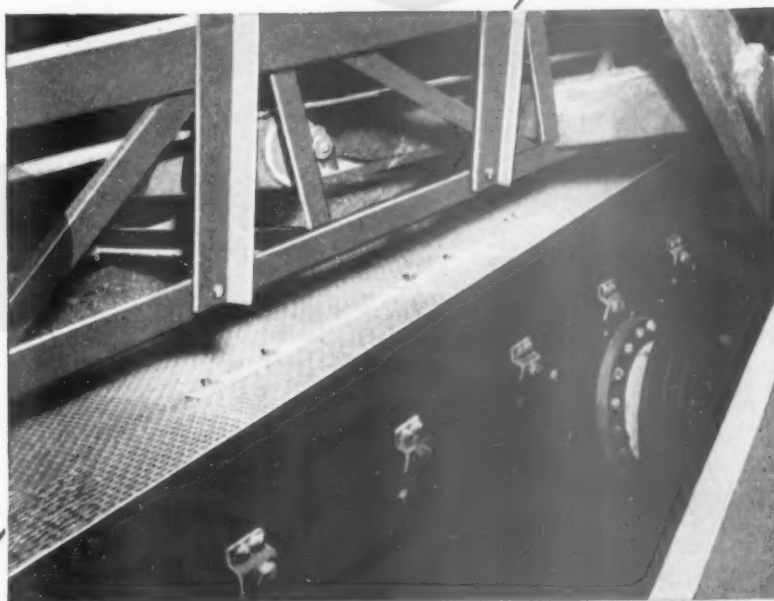


OTHER WEMCO PRODUCTS

Mobil-Mills • Coal Spirals • HMS Thickeners • HMS Pumps • Sand Pumps
Cone Separators • Drum Separators • Fagergren Laboratory Units • Agitators
Fagergren & Steffensen Flotation Machines • Hydroseparators • S-H Classifiers
HMS Laboratory Units • Dewatering Spirals • Thickeners • Conditioners • Densifiers

bouncing rubber balls

help speed production
of agricultural limestone
at Krueger Quarry



On the Ball Tray Deck of this 4' x 12' Double Deck SIMPLICITY Screen at the Krueger Quarry in Winchester, Illinois, bouncing rubber balls team up with SIMPLICITY's unique gyrating action to produce agricultural limestone at the rate of 60 tons per hour. Production goes along without interruption because the lively rubber balls, bouncing in compartments on the lower deck, prevent build-up of the soft limestone and keep it from blinding the 5/32" screen even when the material is damp.

SIMPLICITY Ball Tray Deck Screens like this one at the Krueger Quarry can do a better job of processing damp, sticky material for you. Other SIMPLICITY Screens with single, double or triple decks can help speed production and cut the costs of all your screening operations. For complete information, consult a SIMPLICITY sales engineer or write us today.

123

Sales representatives in all
parts of the U.S.A.

FOR CANADA: Canadian Bridge Engineering
Co., Ltd., Walkerville, Ontario

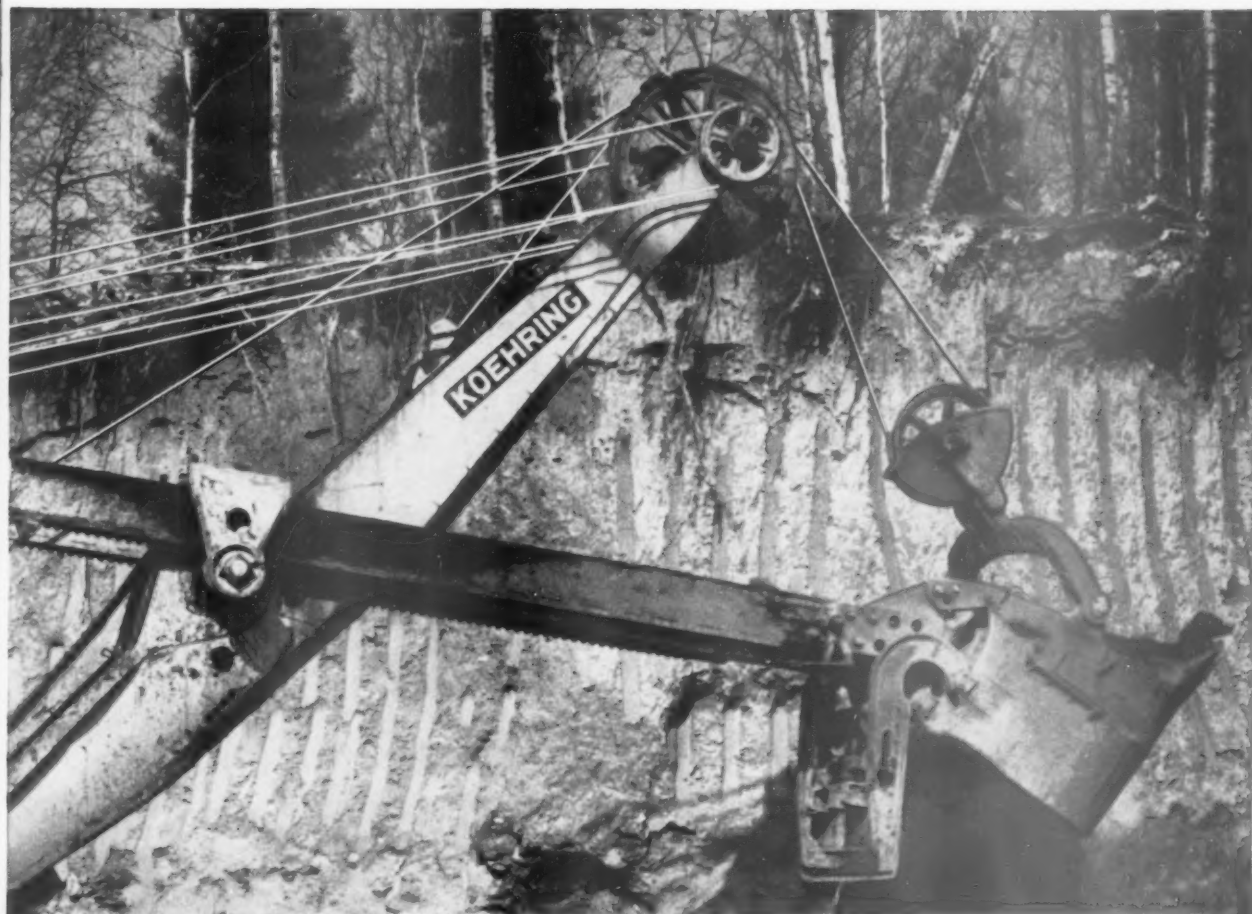
FOR EXPORT: Brown and Sides, 50 Church
Street, New York 7, N. Y.

[S]implicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND, MICHIGAN



7½ to 79½ TONS lift capacity... ½ to 2½ YARDS dipper capacity



**Get all the facts on
"KOEHRING WORK CAPACITY"**

With any shovel or crane, all mechanical features, operating advantages, speeds and capacities add up to one deciding factor . . . cost per yard moved or ton lifted. To make sure you get the biggest profit advantage in excavators and cranes, get all the data on "KOEHRING WORK CAPACITY". For specific facts and figures, see your Koehring distributor soon.

K229

KOEHRING Company

MILWAUKEE 16, WISCONSIN

Subsidiaries: Kwik-Mix • Johnson • Parsons

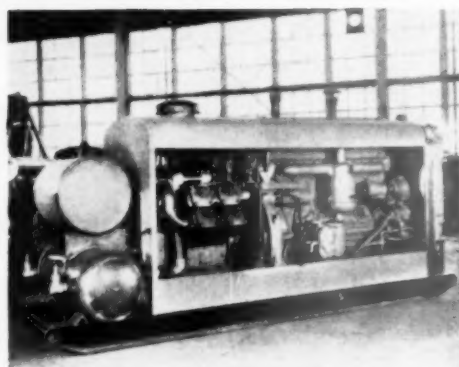
"AIR POWER" by MURPHY DIESEL

rugged, reliable, responsive



GARDNER-DENVER
truck mounted
compressor powered
by a Murphy Diesel.

INGERSOLL-RAND
semi-portable
compressor powered
by a Murphy Diesel.



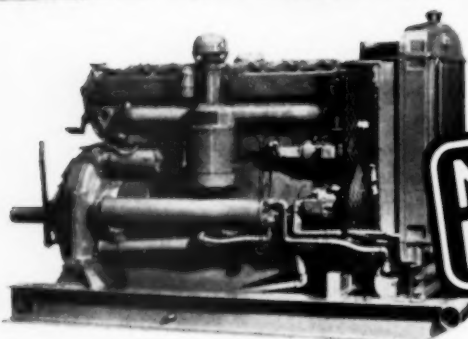
JAEGER portable
powered by a
Murphy Diesel.

JOY stationary
compressor powered
by a Murphy Diesel.



LE ROI portable
compressor powered
by a Murphy Diesel.

WORTHINGTON
portable compressor
powered by a
Murphy Diesel.



**MURPHY
DIESEL**

**MURPHY
DIESEL COMPANY**

5315 W. Burnham St. Milwaukee 14, Wisconsin

254 A

Heavy duty power for rock crushing

Murphy Diesel engines and power units are available in sizes from 90 to 226 H.P. Engine speeds are 1200 and 1400 rpm. Also available are dual-fuel engines, crude oil burning engines and altitude

engines which will maintain sea level ratings up to 9000 ft. "Packaged" generating units are available with capacities ranging from 60 to 140 K.W. A.C. or D.C. voltages to suit your requirements.

**"I always choose my Primacord
as carefully as I use it . . .**

"I've used Primacord to shoot over-burden, ore, rock — and to ditch and clear right-of-way all-over the country. I get good results every time because I choose my Primacord as carefully as I use it.

"Plain Primacord I put down in small-bore or shallow holes, and also use it for the trunk line to hook them up. It's strong, light in weight, and economical. It's easy to tie tight to make a good connection.

"Reinforced Primacord is good insurance where I'm loading deep holes. It'll carry more weight and has a tougher cover to resist abrasion and cutting.

"Wire Countered Primacord is bound with fine wire. I always use it if I think there's any danger of sharp rocks or heavily reinforced explosives containers cutting the Primacord.

"Plastic Reinforced Primacord has a tough, water-proof plastic cover. I've used it in river crossings, in deep holes, or where field shots must stand a long time before blasting. It will take a lot of punishment, and is not affected by high summer heat or winter cold."



THERE'S A TYPE OF PRIMACORD
FOR EVERY JOB

Type	Shipping Weight		Tensile Strength
	500 ft.	1000 ft.	
Plain	9 lbs.	19 lbs.	113 lbs.
Reinforced	10 "	20 "	160 "
Wire Countered	19 "	35 "	220 "
Plastic Reinforced	12 "	22 "	250 "

Ask your explosives supplier
or write for further facts to

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut

Also Safety Fuse since 1836



Use PRIMACORD®

The PROVED and APPROVED DETONATING FUSE

No Blinding!

...SCREENING MOIST PULVERIZED LIMESTONE

ALLIS-CHALMERS THERMO-DECK Heating Unit

No blinding on this Ripl-Flo screen handling moist limestone.



This is what happened on the same screen when we turned the Thermo-Deck heating unit off for half an hour.

Thermo-Deck heating units can be applied to your Allis-Chalmers screens in the field. For more facts, call the A-C representative in your area or write for Bulletin 07B7812. Allis-Chalmers, Milwaukee 1, Wisconsin.

SCREENS MOIST, FINE MATERIALS . . . with no "time out" to clear the screen cloth. Low voltage resistance heating keeps screen mesh free of blinding.

HEATED CLOTH LASTS 3 TIMES AS LONG! Clear screen cloth carries less weight than blinded cloth; has less tendency to whip. Damage resulting from pounding or brushing is greatly reduced.

SCREENING CAPACITY INCREASED 2 WAYS! More tonnage goes through the screen when cloth *remains* open. And, with no downtime to clear the screen, more tonnage goes through per day.

A-3935

Thermo-Deck and Ripl-Flo are Allis-Chalmers trademarks.

ALLIS-CHALMERS



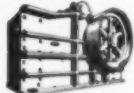
Sales Offices in
Principal Cities in
the U. S. A. Distributors
Throughout the World.



Hammermills



Vibrating Screens



Jaw Crushers



Gyratory Crushers



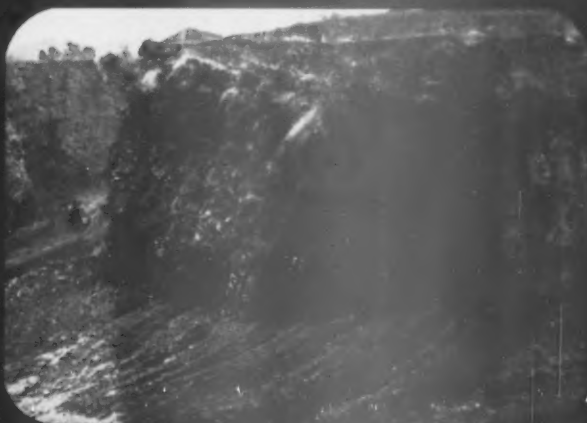
Grinding Mills



Kilns, Coolers, Dryers



Here's how ROCKMASTER® blasting increases explosives efficiency



YOU can see ROCKMASTER efficiency in these pictures, taken at the height of four different ROCKMASTER blasts. There is no flying rock, no geysering of explosive force. ROCKMASTER keeps the power of the blast confined, using all the explosives energy to produce maximum breakage with maximum efficiency.

When the blast is initiated at the point of maximum confinement, the explosive force follows the line of least resistance . . . directly into the burden. With ROCKMASTER millisecond blasting, the first initiation places the burden under maximum stress, producing lines of weakness

throughout the burden. A split-second later, the next charge hits the stressed material with a shattering force that produces maximum breakage . . . maximum use of the explosive force. It is the "one-two punch" applied to blasting.

Ask your Atlas technical representative to show you the picture presentation of the ROCKMASTER story. See for yourself how the millisecond delay electric blasting caps teamed with the ROCKMASTER system of explosives choice can give you greater blasting efficiency through complete confinement of the blast.



ATLAS EXPLOSIVES

"Everything for Blasting"

ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE

Offices in principal cities

12 tried reasons recommend these

F-H AIRSLIDES



- Ease of erection, high capacity with low head room. Simple floor or overhead supports save floor space.
- Low Maintenance—no complicated drives, no chains, bolts, speed reducers, etc.
- Dustless, noiseless operation.
- Ease in change of direction.
- Extremely low power consumption.
- Small volume of air at low pressure.
- Extreme flexibility not available with mechanical, straight-line conveyors.
- No lubrication. Less weight and bulk.
- Large stock of repairs parts unnecessary.
- No industrial accident hazards.
- Eliminates frequent, costly production interruptions.
- Less labor costs for repairs and replacements.

Here is a typical installation of F-H Airslides, the conveyor system that *floats* dry, pulverized materials like water. These Airslides deliver pulverized limestone to a hopper above a Fuller-Kinyon Pump, which elevates and conveys the limestone to a grinding-mill feed bin.

F-H Airslide Conveyors have innumerable applications. They eliminate dust nuisances, save man-hours, keep production *flowing smoothly* at minimum operation costs.

The twelve tried and tested reasons at the left are accepted by many Airslide users. If Airslides are new to your material handling thinking, why not ask now for complete data. It may save you money — and it will cost you nothing for this valuable data.

Fuller

FULLER COMPANY, Catasauque, Pa.
120 So. LaSalle St. • Chicago 3
420 Chancery Bldg. • San Francisco 4

DRY MATERIAL CONVEYING SYSTEMS
AND COOLERS—COMPRESSORS
AND VACUUM PUMPS—FEEDERS
AND ASSOCIATED EQUIPMENT

FH-31
1674

Cut Your V-Belt Costs Right Now!



—this test tells how!

If you want longer V-Belt wear and lower V-Belt costs just make this simple test. Bend any V-Belt that has *straight sides* and—as it bends—*feel* the sides bulge out! (See Fig. 1-A, below)

This out-bulge forces the belt to press unevenly against the V-pulley and of course wear on the belt is concentrated where it bulges most. Naturally this shortens the life of a *straight-sided* V-Belt.

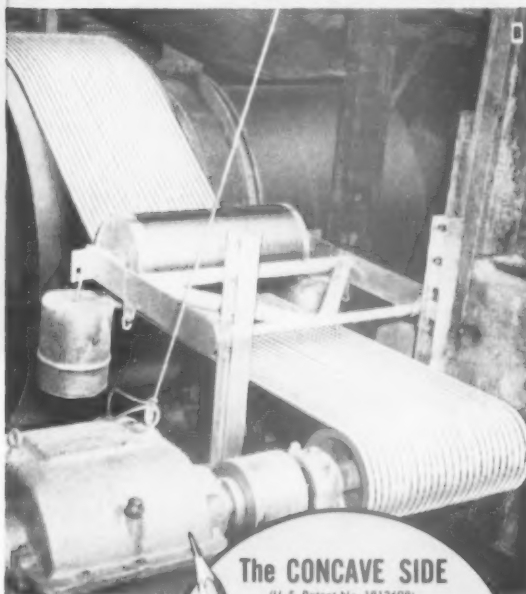
Now, make this same test with the belt that is built with *concave sides*—the Gates Vulco Rope!

See the difference? There is no *out-bulge*! The precisely engineered concave sides *fill out* and become *perfectly straight*. They now *exactly fit* the sheave groove and therefore *press evenly* against the V-pulley. This distributes all wear *uniformly* across the *full width* of the Gates Vulco Rope. And this means longer belt life and *lower belt costs* for you.

Only V-Belts made by Gates are built with concave sides. Whenever you buy V-Belts, be sure that you get the V-Belt with Concave Sides—the Gates Vulco Rope!

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

Silica dust quickly wore out the gear and pinion drive on this sand drying drum. So a Gates man suggested building a flat pulley around the drum (as shown) and running V-Belts on it. Mr. M. D. Pinkerton, plant superintendent, says, "It cost about \$4500 to make the change but we are saving about \$15 per day without a bit of trouble. The original Gates Vulco Ropes are still good after running every day since September, 1949."



The CONCAVE SIDE

(U. S. Patent No. 1813698)



What Happens When a V-Belt Bends

Straight-Sided V-Belt



How a Straight-Sided V-Belt Bulges in the Sheave-Groove. Sides Press Unevenly Against the V-Pulley, Causing Extra Wear at Point Shown by the Arrows.

Gates Vulco Rope With Concave Sides



The Concave Sides Fill Out to Precise Fit in Sheave-Groove. No Side-bulge! Sides Press Evenly Against the V-Pulley — Uniform Wear and Longer Life!

CS-531



VULCO ROPE

DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

V-Belts — Hose
Molded Rubber Goods
for industry
World's Largest Maker
of V-Belts

WE say the Allis-Chalmers HD-20 is designed to **OUTPRODUCE, built to **OUTLAST****

But anyone can make claims . . . That's why we invite you to get the facts firsthand from HD-20 owners. Just call your nearby Allis-Chalmers dealer. He'll be glad to tell you where you can see these great tractors at work . . . where you can talk to the men who own or operate them. When you do, experience tells us you'll hear about these big benefits:

Hydraulic torque converter drive gives the operator the equivalent of hundreds of gear ratios in two speed ranges — automatically selects the proper speed for maximum production. With hydraulic torque converter drive, you take full advantage of available horsepower . . . even at creeping speed. And cushioned protection means fewer repairs . . . longer life of tractor and auxiliary equipment.

In dozing, pushing or shovel work, there's nothing like the HD-20 for sheer productive power. Torque converter actually multiplies torque up to four and one-half times . . . develops tremendous drawbar pull to start the load smoothly, and automatically accelerates to highest speed conditions permit, in either high or low range.

New design, new performance. The HD-20 is built to take it— with such design advantages as all-steel welded construction . . . balanced weight and power . . . extra heavy main frame. Hydraulic control permits steering this 20-ton giant with only the touch of a finger.

Easy to service, easy to maintain. 1,000-hour lubrication intervals for truck wheels, idlers, support rollers; no lubrication fittings under tractor. Major units are easily removed without disturbing adjacent parts; adjustments are simple.

See for yourself the many profit-making applications of the HD-20. Ask your Allis-Chalmers dealer to show you this outstanding tractor at work.





ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

41,000 POUNDS
175 NET ENGINE HORSEPOWER
GM 2-CYCLE DIESEL ENGINE

ROCK PRODUCTS, February, 1953



LIMA
604 SHOVEL
1 1/2 YD. CAPACITY

AUSTIN-WESTERN
201 PORTABLE CRUSHING
AND SCREENING PLANT

**"We got more gravel for less money
with this powerful team!"**

...says CONTRACTOR FRANK ROSSI of Gardiner, Me.

"By teaming our LIMA shovel with our Austin-Western crusher, we made our own surfacing material for this new section of the Roosevelt trail . . . cutting time and costs by crushing and screening gravel on the job."

Such reports are not surprising when the team-mates on the "production line" are these . . .

LIMA TYPE 604 SHOVEL—A convertible shovel (1 1/2 cu. yd.), crane (30 ton) and dragline . . . very popular for road grading, quarry and gravel pit operations, and diverse construction and material handling work. Its air operated clutches and anti-friction bearings guarantee smooth, quick operation. Streamlined, counter-balanced design assures you greatest capacity per pound of weight.

AUSTIN - WESTERN "201"—Portable Crushing and Screening Plant with high production and low

operating cost. The "201" excels in production because of its high operating speeds and exclusive design features, oversize conveyors and extra-large screening capacity.

THERE'S A LIMA-A.W. TEAM FOR EVERY JOB!

There are **LIMA** shovels ranging in capacity from 3/4 to 6 yards, convertible to cranes with capacities up to 110 tons.

There are **Austin-Western** crushing plants for any requirement . . . small portable units with single crusher and screen, multiple portable units, or stationary crushing and washing plants . . . each giving you maximum production at minimum cost.

Note: Austin-Western Crushers are now being manufactured in Lima, Ohio, enabling us to maintain steady, top-quality production of crushers.

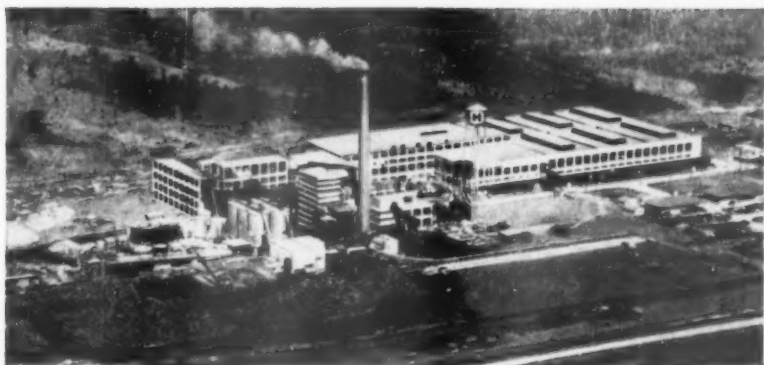
LIMA
SHOVELS • CRANES
DRAGUNES • PULLSHOVELS



Construction Equipment Division

BALDWIN-LIMA-HAMILTON CORPORATION
Construction Equipment Division
LIMA, OHIO, U.S.A.

HUDSON MULTIWALL SACKS ARE NOW THE INDUSTRY'S MOST FULLY GUARANTEED



This huge new ultra-modern Hudson mill at Palatka, Florida can make firm promises because it is independent of outside suppliers who may cause delays. Here, every step in the manufacture of Hudson Multiwall Sacks, from tree to the finished product, is under Hudson's exclusive ownership.

INTEGRATED OPERATION BACKS UP HUDSON GUARANTEE

PALATKA, FLA. Hudson is the only Multiwall Sack manufacturer to guarantee its sacks against breakage on the filling or closing machines. The company has enough faith in its product to agree to replace without cost all Hudson Multiwall Sacks that fail on the purchaser's packing or closing machines.

Hudson's fully integrated operation provides the control of quality that such an unusual guarantee demands. Variations from outside suppliers are eliminated. To assure a dependable source of pulp Hudson owns and maintains 435,000 acres of choice timber. The strong, long-fibered Kraft is manufactured with laboratory controlled uniformity. The finished sacks (pasted, sewn, valve, or open mouth) are tailored to your most exacting specifications. And assured delivery is available by rail, truck, or water.

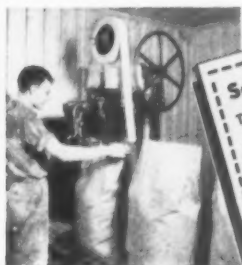
HOW HUDSON'S NEW GUARANTEE WORKS



When Hudson Multiwall Sacks are delivered into your custody, the company's new guarantee goes into full force.



All Hudson Multiwall Sacks must successfully pass your packing machines or be replaced without cost.



All Hudson Multiwall Sacks must pass your closing operations without failure, or Hudson will replace them.

Replaces Multiwall Sacks broken on your packer

NEW YORK CITY. "Our new guarantee to replace without cost every sack broken in packing and closing on your machines," stated



T. H. Mittendorf

T. H. Mittendorf, Hudson's Vice-President in Charge of Sales, "makes our Multiwall Sacks the most fully guaranteed in the industry. This is a big advantage to buyers because now they can count on using every sack they purchase."

Mr. Mittendorf further explained, "Until Hudson introduced this new replacement policy, every user had to pay for his own losses for normal breakage on the packing or closing machines. But Hudson's new guarantee has changed all that. Now, when you use Hudson Multiwall Sacks, your original cost for sacks is your final cost!"

Urge Multiwall Sack users to write for facts

The Hudson Pulp & Paper Corp. invites all users of Multiwall Sacks to learn how they can benefit using guaranteed Hudson Sacks.

Example: I have used Hudson Sacks and see this is the best I have ever used. I am sure they are promised!

Send for full details:
Tell me, without obligation, about the many advantages of your new Multiwall guarantee.

NAME _____
COMPANY _____
STREET _____
CITY _____

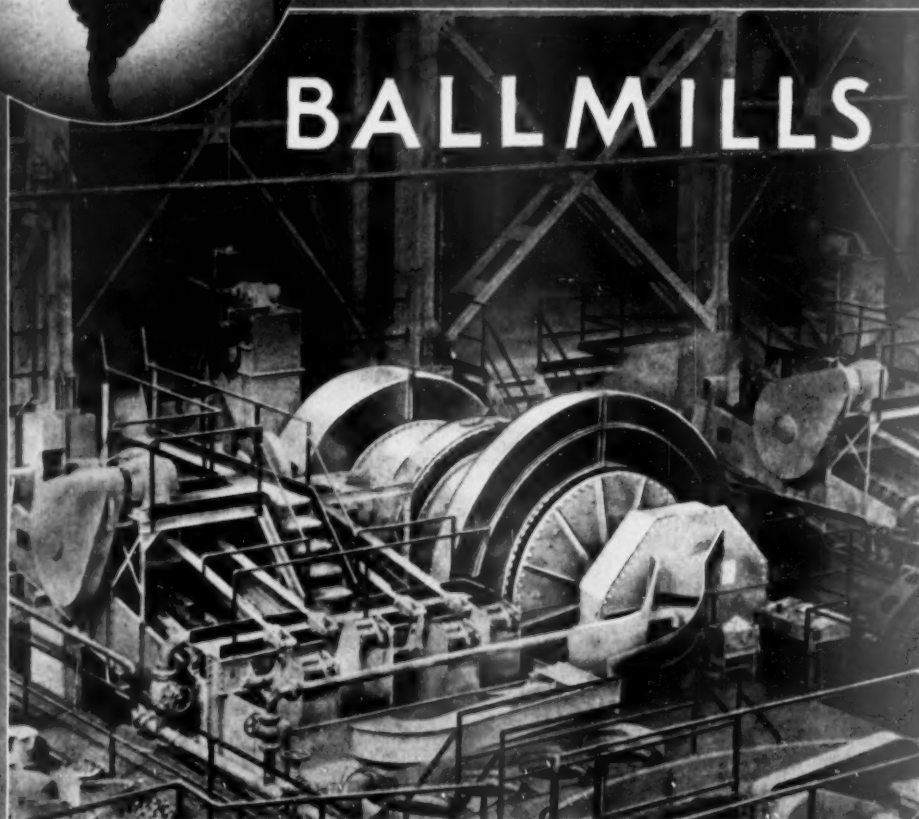
ZONE _____ STATE _____

Hudson Pulp & Paper Corp.
Dept. 113, 505 Park Ave., New York 22, N.Y.



SMIDTH

BALLMILLS



**WET OR DRY GRINDING
OPEN OR CLOSED CIRCUIT
ALSO AIR SWEEP FOR GRINDING AND DRYING**

For Smidth Machinery apply to:

F. L. Smidth & Co., A/S
Vestergade 33,
Copenhagen K, Denmark

F. L. Smidth & Co.
11 West 42nd Street
New York 36, N. Y.

F. L. Smidth & Co., Ltd.,
105, Piccadilly,
London, W. 1, England

F. L. Smidth & Cie France
80 Rue Taibout
Paris (9e) France

F. L. Smidth & Co. of Canada, Ltd.
11 West 42nd Street
New York 36, N. Y.

F. L. Smidth & Co. (Bombay) Ltd.
42 Queen's Road
Bombay, India

"WE HEAR..."

February, 1953

Heavy construction awards, nationally, totaled \$15.7 billion in 1952, an increase of 15 percent over the previous record set in 1951, as reported by Engineering News-Record. Construction in 1953, which is expected to continue at a high level, is predicted as follows: highway awards will reach \$1.7 billion, an increase of 25 percent over 1952 figures; bridge awards, \$500 million, 21 percent above 1952; sewerage contracts, \$350 million, a 15 percent increase; public buildings (other than atomic energy plants and public housing), \$2.1 billion, a 7 percent increase; public housing contracts, \$500 million, down 17 percent; earthwork and waterways, \$450 million, down 9 percent; waterworks, \$231 million, about the same as in 1952; commercial building, \$1.1 billion, up 30 percent; private mass housing, \$3 billion, same as 1952 level; industrial building, \$2.5 billion, down 8 percent; private unclassified construction, \$630 million, a 20 percent increase over 1952.

Plans were recently announced by Air Reduction Co., Inc., to double the capacity of its new calcium carbide plant at Calvert City, Ky. The original plant, which is nearing completion, has a rated capacity of 142,500 tons of calcium carbide per year. The additional capacity is expected to be available early in 1954. Much of the Calvert City production will be shipped to Louisville, Ky., to supply acetylene to the DuPont company's neoprene plant.

The Atomic Energy Commission recently held a "closed-door" conference in Tampa, Fla., to discuss problems of uranium recovery from phosphate rock. Attending the conference were approximately 100 representatives of 18 companies dealing with phosphatic materials and eight laboratories holding commission contracts for research and development work, A.E.C. staff members, and members of the advisory committee to the commission's raw materials division.

Political campaigning was really placed on a "concrete" basis recently in the Ohio State Auditor's office. It seems that funds, contributed by contractors, supposedly for concrete, were used for political campaigning. Auditor Joseph T. Ferguson claimed that the funds were collected by two aides without his knowledge, but promised they would be returned.

Limited access highway tax bonds, amounting to \$20,000,000, were recently placed on the market by the State of Michigan to help finance a \$25,000,000 Detroit-Toledo Expressway. The balance of the cost of the roadway will be financed by the federal government and the Michigan Highway Department.

German engineers have opened a 500-ft. stretch of highway near Hamburg which they claim will be snow-proof in temperatures down to 70 deg. below zero, without the aid of any heating apparatus, according to Engineering News-Record. Although no chemical details were given, the frost-melting surface was said to consist of a chemical emulsion, called "E. C. 999 A.N.," mixed into the surface of the road. The inventor claims that the chemical, plus electromagnetic radiations from the earth, will dissolve snow and ice.

A misfortune occurring recently at an eastern concrete block plant should serve as a warning to other producers who may have abandoned machinery about their plants. Two boys, playing about the plant yard, received severe facial burns when one of them dropped a lighted match into the gasoline tank of a discarded piece of machinery.

WE HEAR

Relics and objects up to 200,000 years old have been unearthed during excavating operations at Concrete Material Co.'s gravel deposits near Des Moines, Iowa. Howard Barnett, superintendent, who is a member of the Des Moines Geologists Club and the Iowa Mineral Society, is making a collection of these historic objects and rare rock formations. Included in the collection are musket balls of early settlers, Indian arrowheads and tomahawks, elk antlers, the skull of a prehistoric bison, massive teeth of the mammoth and mastodon, remnants of an old log cabin and several hand-made utensils.

* * * * *

An injunction restraining two contractors from taking additional gravel from Cattaraugus Creek, within the Cattaraugus Indian Reservation, was recently issued in Buffalo, N.Y., by John Knight, federal judge. The restraining order was granted on the complaint of the president of the Seneca Nation community, that the contractors had refused to pay the Seneca Nation for gravel removed from the reservation property. The contractors stated they had paid individual Indians for the gravel. In directing the contractors to meet again with the Seneca Nation Council in an effort to reach a settlement, Judge Knight reminded them the reservation property is owned by the community of the Seneca Nations and individual Indians occupy the land only as tenants.

* * * * *

The steel industry has recommended that the government start a 3-step decontrol of steel production. Under the plan, civilian allocations would be liberalized around the first of the year; further liberalized by April 1; and the C.M.P. plan for steel would be completely ended by July 1.

* * * * *

According to recent reports, fluorspar deposits have been discovered in Jamaica, but the Geological Survey has not been able to visit the area to verify the report, or to determine the extent of the deposits.

* * * * *

The U.S. government has lent out more than \$87 billion of foreign aid during the last 12 years, as reported by the Commerce Department. The money covers all types of foreign programs.

* * * * *

Construction contract awards in the 37 states east of the Rockies for the first eleven months of 1952 totaled \$15,307,552,000, an increase of 5 percent over the corresponding period of 1951, according to an F. W. Dodge Corp. report. Non-residential awards of \$5,985,964,000 were down 4 percent; residential awards of \$6,228,924,000 were up 6 percent; and public works and utilities amounting to \$3,092,664,000, were up 27 percent. Construction awards for the month of November amounted to \$1,248,803,000, a decrease of 5 percent from October, but 34 percent greater than in November, 1951.

* * * * *

The adverse effect of the recent steel strike on the lime industry was reflected in the monthly lime statistics compiled by the Bureau of Mines. According to the report, total lime shipments were reduced on an average of about 30 percent during June and July, 1952, as compared with the previous two non-strike months of April and May. This included both dead-burned dolomite and fluxing lime.

* * * * *

As recently ruled by the National Labor Relations Board, an employer is not required to bargain with its workers' union during a "slow-down." This decision was made in the case involving Phelps Dodge Copper Products Corp., Elizabeth, N.J., and the C.I.O. Electrical Workers.

* * * * *

The first prestressed concrete highway bridge in the west will be built by the U. S. Bureau of Public Roads on U. S. Highway 101, north of Coos Bay, Ore. The design, which calls for the post-tensioning of 28 girders 45 ft. long and 28 girders 60 ft. long, has been arranged to facilitate the use of the Freyssinet system of stressing. The structure will be 423 ft. long with a 2-lane roadway 30 ft. wide between curbs. A report of the project, including specifications for casting and post-tensioning of girders, appeared in the November, 1952, issue of "Western Construction."

THE EDITORS



Take a close look . . .

It's designed especially for top kiln performance!

TAKE a close look at Permanente Periclase-Chrome bricks for rotary cement kilns and you'll find they cut down-time for replacements to a minimum—give you higher production. That's because they are *developed especially* for hot zone linings.

Their special design combines high purity, pre-shrunk periclase grains with an *exclusive* patented bonding medium. Result: a kiln lining of maximum refractoriness with high resistance to chemical attack by cement clinker.

Verified performance records show that Permanente Periclase-Chrome brick have withstood as many as 17 shutdowns for various causes without any loss of brick due to spalling. They take a good coating, hold it well, and have great resistance to thermal shock.

If you feel that an appraisal of your rotary kiln performance

would be helpful, Kaiser Chemicals will be glad to work with you. Installation assistance also is available at no extra cost.

Standard brick sizes supplied in both burned and chemically bonded forms. Recently expanded facilities insure superior service. Call or write principal sales offices: *Chemical Division, Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California. First National Tower, Akron 8, Ohio.*

Kaiser Chemicals

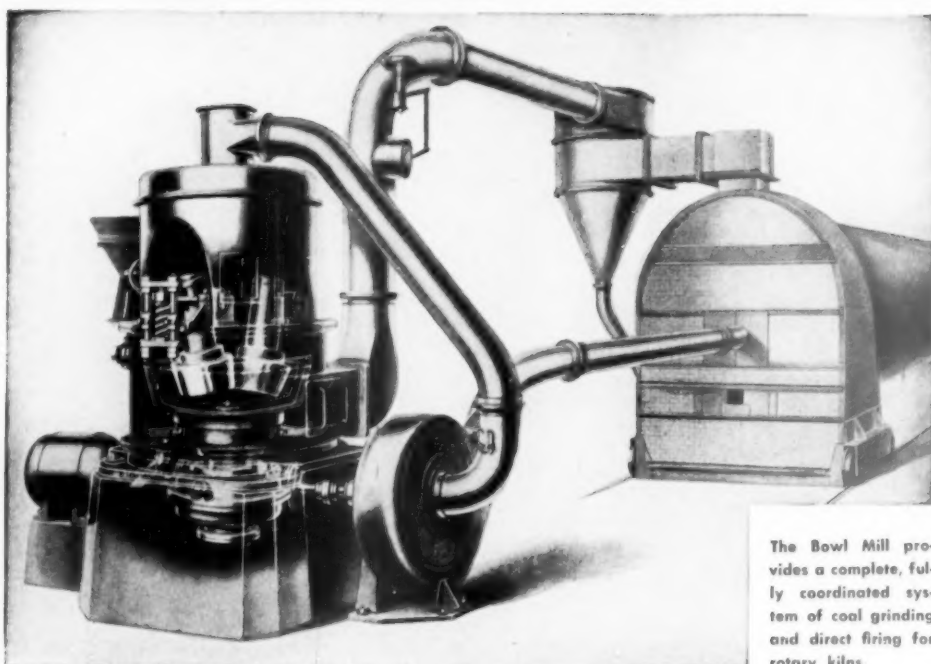
Pioneers in Modern Basic Refractories

Basic Refractory Brick and Ramming Materials • Dolomite • Magnesite • Magnesite • Alumina • Periclase

RAYMOND BOWL MILL

Raymond
Bowl Mill
Catalog
No. 62

Write for Your
Copy TODAY!



The Bowl Mill provides a complete, fully coordinated system of coal grinding and direct firing for rotary kilns.

Direct firing with the Bowl Mill helps to maintain maximum kiln efficiency, because this modern pulverizing unit provides complete firing control and uniform fineness of coal. This system is so flexible that it meets the many requirements of the modern plant:—

- Handles coal of any grade or moisture content
- Easily adjusted or lubricated while operating
- Sturdily built for continuous 24-hour operation
- Adjustable for a wide range of capacity

In hundreds of installations, the Raymond Bowl Mill shows important savings for all types of kilns . . . cement, lime, dolomite and magnesium, as well as for industrial furnaces.

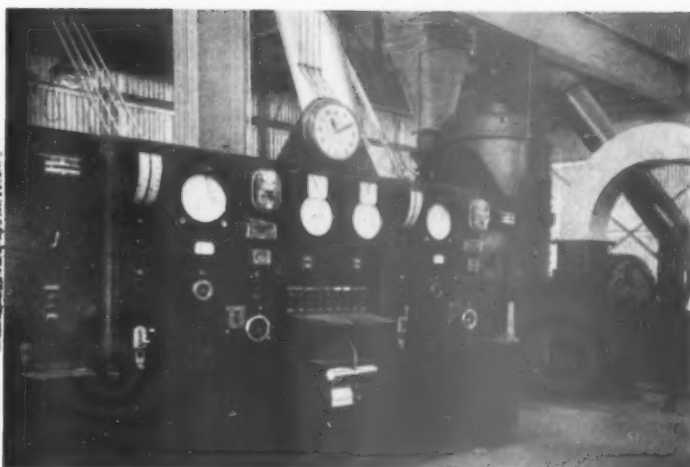
COMBUSTION ENGINEERING

RAYMOND PULVERIZER DIVISION

1307 North Branch St.

Chicago 22, Illinois

VISUAL CONTROL OPERATING PANEL



This Panel Board Control System gives a complete operating picture of the Bowl Mill at all times.

It indicates and records Temperatures, Feed Rates, Exhauster Pressure and Mill Suction, Amperage, Mill Air Flow, and also contains signals and motor controls.

Close regulation of the Bowl Mill and its quick response to changes insure uniform delivery of the coal-air mixture to the burning zone . . . the answer to low cost kiln operation.

-SUPERHEATER, INC.

Sales Offices in
Principal Cities



PICKED ... FOR ANOTHER TOP-LEVEL OPERATION ...

Now at
CHUQUICAMATA
(CHILE, S. A.)
SHEFFIELD
MOLY-COP
TRADE MARK
COPPER-MOLYBDENUM-ALLOY
Grinding Balls

Deliver Higher Efficiency and Economy

THE STORY of Chuquicamata can be told only in superlatives ...

THE LARGEST known copper orebody in the world, will produce more than 300 million pounds of blister copper a year, and treat 30,000 tons of ore a day. The Anaconda workings are a landmark in mining operations.

SHEFFIELD MOLY-COP GRINDING BALLS play a vital role in this record-breaking project. Their longer service in the new sulphide concentrator means lower grinding costs, fewer chargings, and less "down time."

SUPERLATIVE PERFORMANCE of Sheffield Moly-Cop grinding balls is the result of years of research, and quality-controlled methods of manufacture—from initial alloy steel production to final heat treatment.

Used and
PROVED
Around
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LET SHEFFIELD prove how Moly-Cop Grinding Balls will do a better job for you.

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IN THE PIT! IN THE PLANT!

save your rustable metal surfaces indoors and out!

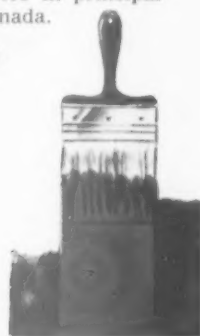
STOP RUST! *with* RUST-OLEUM

Protect Your Equipment, Pipes, Conveyors, Crushers, Dusters, Metal Structures, Tanks, etc.

RUST-OLEUM can do a whale of a job for you in helping to resist fumes, dust, rain, snow, moisture, and weathering! So easy to apply that *one man* often does the work of two — just wirebrush and scrape with sharp scrapers to remove rust scale and loose particles — then apply by brush, dip, or spray directly over remaining rust! Costly sandblasting and chemical pre-cleaning are not usually required. You save time, labor, money — you beautify as you protect because RUST-OLEUM is available in all colors, aluminum and white! Get the facts today. Prompt delivery from Industrial Distributors in principal cities in the United States and Canada.

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May be applied directly over rusted surfaces

Available in all Colors,
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For TOUGH jobs with years of work ahead...



MARION 111-M Ward-Leonard Electric shovel owned by the Hydro-Electric Power Commission of Ontario, making a cut for an open canal and recovering aggregate for concrete work.

MARION 111-M Ward-Leonard Electric

Rock and ore have a way of making things rough for an ordinary shovel.

The machine may win, in the first few months, over the stubborn resistance of shot rock. But it still faces the test of time, for rock and ore "wear down" an ordinary shovel and break its spirit.

It's on the tough jobs, with years of work ahead,

that the MARION 111-M Ward-Leonard Electric shovel has a chance to prove its real worth. Today this MARION is winning the battle of the rock pile and the ore pit on many a front.

Its victories mean greater production, lower operating cost, less maintenance expense and fewer work stoppages. Its powerful electric muscles and the shock-tested members of its frames and machinery assemblies are making owners say, "This is it!"

It doesn't cost anything to find out what the 111-M Ward-Leonard Electric can do for you. Your nearest MARION office will be glad to give you the facts.

MARION

POWER SHOVEL CO.
MARION, OHIO, U. S. A.



OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES

from $\frac{3}{4}$ cu. yd.
to 45 cu. yds.

Du Pont "NITRAMON" provides safer . . . more economical quarry blasting



In well drill holes, the watertight metal cans of "Nitramon"* are easily lowered by means of rope attached to triangular-shaped bail on each can. "Nitramon" Primers are similarly loaded and may be detonated with "Primacord."



In coyote tunnels, "Nitramon" allows the use of ordinary electric lighting systems to illuminate the operation and speed up loading. In addition, because "Nitramon" contains no nitroglycerin, it is non-headache-producing . . . a welcome plus value.

Du Pont "Nitramon" is the safest blasting agent known. Not an explosive in the usual sense, "Nitramon" cannot be detonated with ordinary blasting caps or by open flame, friction, falling objects or even the impact of rifle bullets. And yet, charges of "Nitramon" are dependably detonated with a combination of a "Nitramon" Primer and "Primacord."

"Nitramon" has a remarkable safety record in quarries from coast to coast, and its popularity has steadily increased. A companion product—Du Pont "Nitramex"** offers similar safety features, and provides extra strength. It is frequently used in combination with "Nitramon" when hard-shooting conditions are encountered.

Why not introduce the use of Du Pont "Nitramon" and "Nitramex" in your own quarry? They

are dependable...safer to handle...convenient and economical. Ask the Du Pont representative in your area for complete information about these safest of all blasting agents. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

*Reg. Trade-mark for Du Pont ammonium nitrate blasting agent.

**Reg. Trade-mark for nitrocarbamate blasting agent.

DU PONT "NITRAMON"

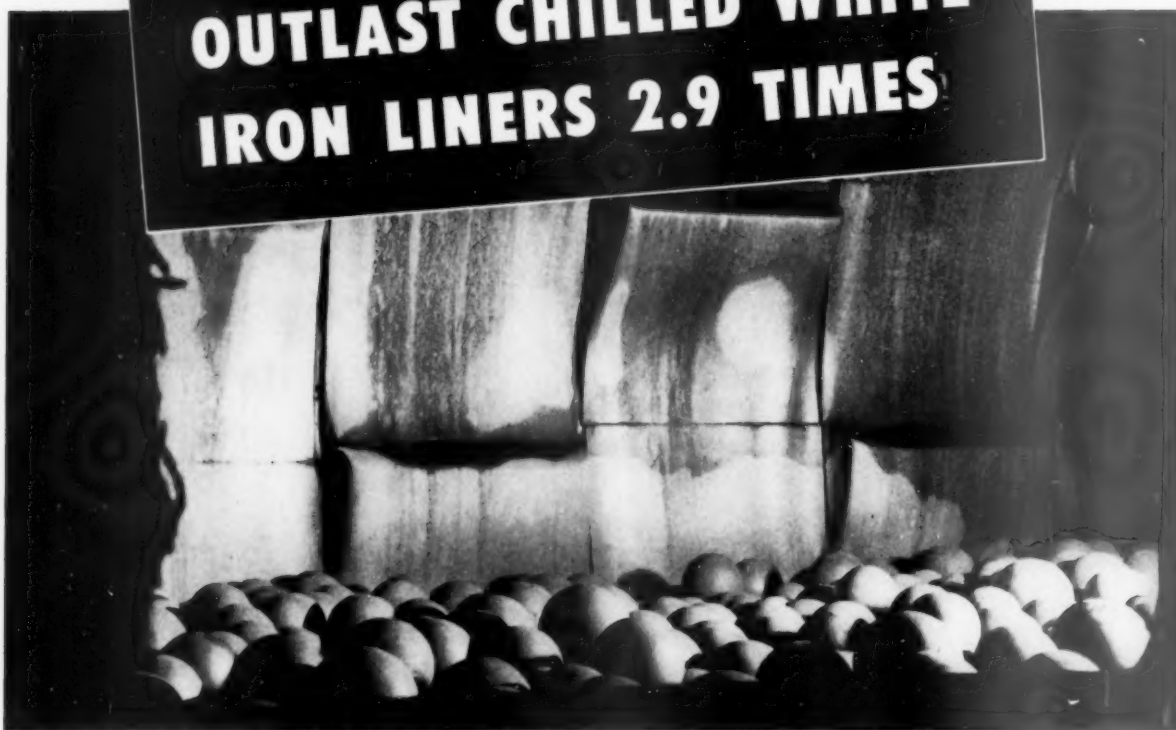
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BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

ABK METAL LINERS

**OUTLAST CHILLED WHITE
IRON LINERS 2.9 TIMES**



Outstanding service life brings big savings

At Keystone Portland Cement Co., Bath, Pa., comparative liner performance in the primary compartment of a 7'-3" diameter wet mill, grinding raw stone with 3½" balls, was as follows:

Life of chilled white iron liners 751,000 barrels

Life of chilled ABK Metal liners 2,180,000 barrels

Experience has shown that the tremendous abrasion resistance of ABK Metal liners will give outstanding service life in primary, secondary and tertiary compartments in both wet and dry

grinding. In spite of their extremely high hardness ABK Metal liners can be worn down as thin as ¼" and some operators have reported sections as thin as ⅛".

Reductions in replacement costs and in "down time" effect substantial savings with the result that many large companies have standardized on ABK Metal mill liner segments.

for better protection against abrasion specify

ABK METAL



BRAKE SHOE AND CASTINGS DIVISION

230 Park Avenue, New York 17, N. Y.

Estimating PRODUCTION AND COSTS



OF Material Movement WITH Euclids



**HERE'S
HELP**

WITH YOUR
**ESTIMATING
PROBLEMS**

PART I ESTIMATING PRODUCTION

JOB ANALYSIS

A basic knowledge of the job, and of the haulage equipment being considered for the job, is necessary to prepare a hauling production and cost estimate. Careful preparation and thorough analysis are required, and an accurate estimate of production must take into consideration the material being moved and the various components of a complete hauling cycle. These are as follows:

HAULING CYCLE COMPONENTS

CONTRIBUTING FACTORS

	LOAD	<p>Size and type of loading machine. Type and condition of material to be loaded. Capacity of hauling unit. Skill of the operator.</p>
	HAUL	<p>Performance ability of hauling unit. Hauling distance. Haul road condition. Grades. Miscellaneous conditions affecting haul speed.</p>
	DUMP	<p>Destination of material. Type and maneuverability of hauling unit. Type and condition of material.</p>
	RETURN	<p>Performance ability of hauling unit. Return distance. Haul road condition. Grades. Miscellaneous conditions affecting return speed.</p>
	SPOT	<p>Maneuverability of hauling unit. Type of loading machine. Location of loading equipment.</p>

2

This enlarged and revised Euclid manual shows how to make a job analysis and provides a method of estimating production and costs for off-the-highway hauling equipment. It will enable you to determine the number and size of hauling units required for any job, and the estimated

cost of moving material per cubic yard or ton.

You'll find the data contained in this book helpful and easy to use. If you haven't received a copy, contact your Euclid Distributor, or write us direct . . . on your letterhead, please. There is no charge or obligation, of course.

The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO

EUCLID



WATCH 'EM SCRAM

when you install
**SUPER-TEMPERED
PRECISION
SPACE
SCREENS**



Production goes up... because of less downtime; and costs go down... because of less frequent screen replacement—when you get these three trouble-makers on the run.

Their names are Abrasion, Vibration and Fatigue and they know they're licked when they try their tricks on Super-Tempered Precision Space Screens. And here's why:

First: Super-Tempered Precision Space Screens stay tight because they're precision crimped and woven extra tightly on powerful hydraulic looms.

Second: They resist abrasion and fatigue because they're made of hard and tough super-tempered steel.

To order, write or 'phone our nearest sales office.

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**SUPER-TEMPERED
PRECISION SPACE SCREENS**

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION



NEW! HEAVY-DUTY BANTAM® Model T-35



**6-ton crane
still at
lowest price
in the industry!**

Seven years ago Schield Bantam revolutionized the shovel-crane industry — with a mobile, high-speed rig, which performed so well that it *outsold all other makes and sizes of truck cranes*. Over 3500 of those early Bantams are still serving efficiently around the world. Now Schield Bantam is proud to announce an even better machine — the husky new T-35 Bantam — with a *conservative lifting capacity of 6 tons at 12'*. Engineered for still wider range of work, with a host of new operating improvements, the versatile T-35 is *ready to start cutting costs on your jobs RIGHT NOW*. Ask your nearest Bantam Distributor for a convincing demonstration, or write today for free *illustrated circular*, containing all the facts you want to know about this new $\frac{3}{8}$ -yd. 6-ton Bantam, with 8 fast-change attachments.



Mounts on special Bantam crane carrier or any std. tandem or heavy-duty single axle truck. Trucks available through factory, or local Bantam Distributors.

BRIEF FACTS

- 54% stronger main frame
- 36.3% more drum clutch surface
- 45.5% more swing clutch surface
- 13% more hoist brake surface
- 4 hook rollers (instead of 3)
- 61.8% more operator visibility for crane work
- Larger shafts and anti-friction bearings throughout
- **FULLY CONVERTIBLE** to shovel, drag-line, clamshell, backhoe, magnet, grapple or pile driver.
- **LOW PRICE** Includes 25' crane boom, 12" block, 2 part line and add'l. counterweight. Truck and mfg. charge extra. (Price subject to change.)



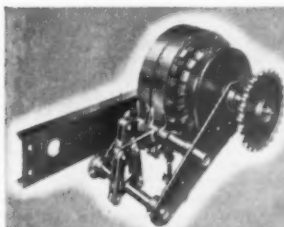
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Bantam Co.**

216 Park St., Waverly, Iowa, U.S.A.

World's largest producer of truck-mounted cranes and excavators

Less than
\$6300.00
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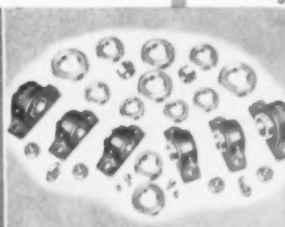
SB-CR-21



Power Boom Hoist Standard improved design with increased brake surface and extra bevel pinion let you "inch" loads up or down with precision accuracy.



Extra Large Clutches & Brakes Internal expanding "snap-in" clutches with molded linings — 140 sq.in. of drum clutch surface, 140.5 sq.in. brake contact.



Full Power Advantages. Engine power transmitted smoothly through main machinery to work points by machine-cut gears and anti-friction bearings.



Rugged Turntable Base. Wider 4-point mounting with 4 over-size trunnion rollers and 4 hook rollers give the T-35 extra strength and stability.

NEW

DODGE-TIMKEN

ALL-STEEL

PILLOW BLOCKS

**HEAVY DUTY
CAPACITY!**

**LESS SPACE!
LESS WEIGHT!**

A JOINT ENGINEERING
DEVELOPMENT BY DODGE AND
THE TIMKEN ROLLER BEARING COMPANY



- All-Steel construction
- A new Timken bearing design
- High radial and thrust capacities
- Compact—minimum dimensions
- Minimum weight with maximum strength
- Fully self-aligning with spherical outer race
- Both expansion and non-expansion types
- Adapter mounting, proven through the years
- Double piston ring seals
- Sealed both on and off the shaft
- Fully assembled, permanently adjusted, lubricated and sealed at the factory

Here are the bearings for industry's toughest jobs. High radial and thrust capacities. Stamina to take heavy shock loads. And all-steel construction packs this load-carrying capacity into less weight and less space. Engineers are already specifying "Dodge-Timken All-Steel" for some of America's largest projects. Write for details and delivery dates, or call your Dodge Distributor.

DODGE MANUFACTURING CORPORATION
2600 Union Street, Mishawaka, Indiana

CALL THE TRANSMISSIONER,
your local Dodge Distributor. Factory trained
by Dodge, he can give you valuable assist-
ance on new cost-saving methods. Look for
his name under "Power Transmission
Equipment" in your classified phone book.



DODGE

→ of Mishawaka, Ind.



Her fingertips imagine the taste

The lady doesn't trust her eyes alone.

The buyer of Multiwalls is in much the same position.

Aside from package design, it's hard to tell one manufacturer's bag from another's simply by looking at it or fingering it.

Put the bags out of sight and you may be able to see many differences.

Men who buy 85 per cent of all Multiwalls consider* these intangibles more important than any other factor when they choose their supplier.

Invariably, these are among the first questions they ask . . .

"Is this company big enough?"

"Do they have a fair allocation policy?"

"Are their prices competitive?"

"Do they respect delivery dates?"

In a nutshell—

"Are they good people to do business with?"

We can't tell you what the answers are when these Multiwall users consider Union. This we do know . . . and the inference is yours to make—

In these days of industrial pressure, when *dependability* is a fervent wish as well as a word, men to whom Multiwalls are important are placing an increasing share of their orders with Union.

More so every day . . .

IT'S UNION FOR MULTIWALLS



*August, 1951 research study.

UNION BAG & PAPER CORPORATION • NEW YORK: WOOLWORTH BUILDING • CHICAGO: DAILY NEWS BUILDING

THE INSIDE STORY OF CONTROLLED IMPACT ACTION



HERE'S WHY

THE PMCO IMPACT MASTER

gives you top capacity . . . lower costs . . . greater control of finished product size

Adjustable feed plate (1) guides in-coming rock at proper angle into first rotor hammer circle (2). In-fed rock is intercepted in motion, exploded instantly by the terrific impact of the rotor hammers and simultaneously projected toward deflector screen grate (3) where finished sizes are immediately discharged.

Oversize particles are deflected upwards, intercepted by feed chute back plate (4) and guided downward into the path of the second rotor hammer circle (5) where they are exploded and projected toward the bottom half of the deflector screen grate and the lower screen grate (7) for immediate discharge.

Both rotor hammers rotate in the same direction toward the rear, promoting fast feeding and keeping all material flowing toward the discharge for top capacity.

Finished product sizes are controlled by the speed of the rotor hammers, and by simple adjustments (8) of stripper bar (6) and lower screen grate.

By controlling the in-fed rock and directing its flow, the breaking is accomplished by the impact of rotor hammers upon the rock. This reduces wear and makes possible the more uniform gradation cubical aggregate.

GET THE FULL PROFIT-MAKING STORY

Write for literature. Get complete details on the PMCO Impact Master. Learn all about its high ratio of reduction which eliminates secondary crushers and auxiliary equipment. Get top quality uniform gradation cubical aggregate and greater production of saleable finished sizes. Impact Masters are used in open and closed circuits for producing road-building and concrete aggregates, and can be adjusted for the simultaneous production of aglime when desired. They are available with capacities to 750 tons per hour. Write today.

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Your Management wants to know...

How valuable dust recovery saves dollars

In every industry, from rock products to food to steel, Buell engineers, working with plant engineers, have established an enviable 18-year record of turning unnecessary dust losses into substantial new profits. What's more, Buell Dust Recovery Systems uncover, for all American industry, these additional important advantages: improved product quality, smoother plant-community relations and higher employee morale.

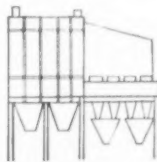
To take advantage of Buell's background and experience in the highly specialized science of dust recovery, ask for further information about Buell's **3 basic systems** of dust collection. See how they can help you turn dust into dollars. Send for Buell's new, informative bulletin titled, "The Collection and Recovery of Industrial Dusts." Buell Engineering Co., Dept. 17-B, 70 Pine Street, New York 5, New York.



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CYCLONE



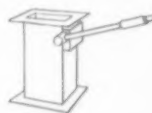
'SF' ELECTRIC
PRECIPITATOR



PRECIPITATOR—
CYCLONE COMBINATION



TYPE 'LR'
COLLECTOR



DUST
HOPPER VALVES



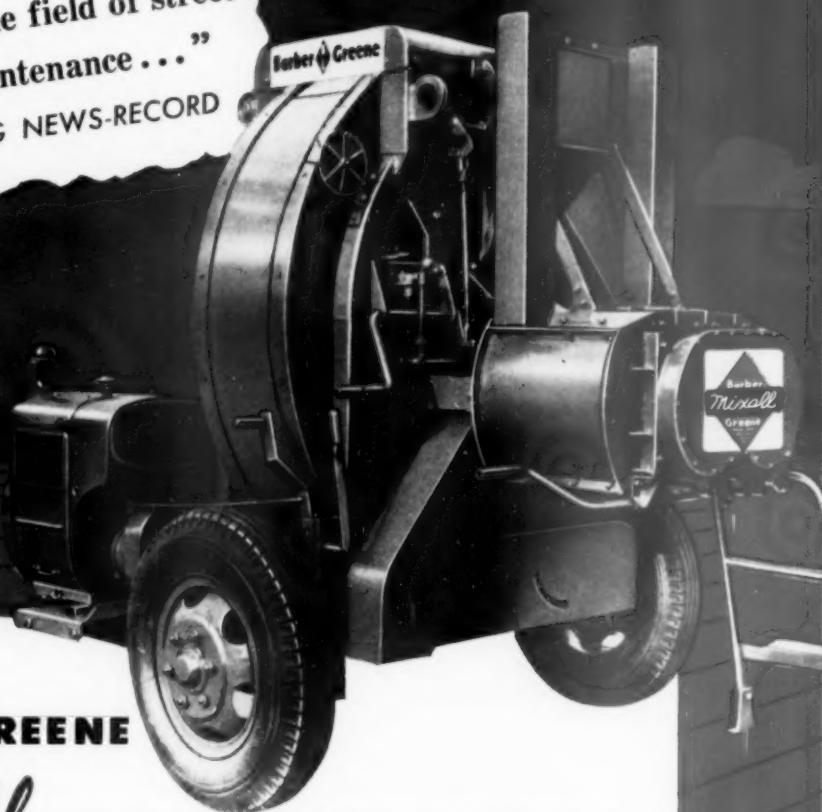
buell

ENGINEERED EFFICIENCY IN DUST RECOVERY

ROCK PRODUCTS, February, 1953

"Undoubtedly the most significant
development in the field of street
and highway maintenance..."
—ENGINEERING NEWS-RECORD

Barber-
Mixall
Greene
MODEL 804
2 CYCLES
1953



**THE NEW
BARBER-GREENE**

Mixall **MEETS THE NEED FOR ALL
MAINTENANCE AND SMALL PAVING JOBS**

The quotation at the top of this page is typical of impartial observers who have seen the new Barber-Greene MIXALL perform. There is widespread agreement among editors, road builders and government officials that the need for a machine capable of on-the-spot production of even the highest type hot mixes has been answered by the development of the MIXALL.

Primarily designed for "stitch in time"

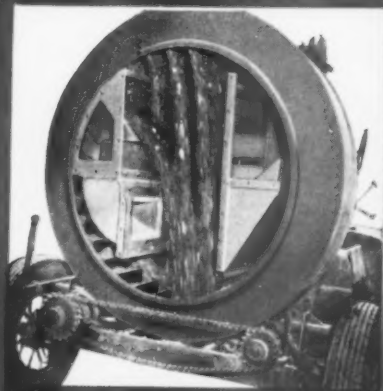
maintenance to prevent major break-ups of much needed roads, the MIXALL also opens the market for surfacing of sidewalks, driveways, parking lots, service stations, playgrounds and countless others.

Once you see the MIXALL perform, you'll quickly recognize the business-building possibilities it holds for you. See your Barber-Greene Distributor for the full story—or write for information.

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...WITH NO COMPROMISE IN DESIGN



Stationary Drum Drying

Proved, efficient rotary drum dryer. Aggregate falls in a thin coat through a sheet of hot gases which removes and drives off all moisture. Same principle as largest B-G dryers.



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Two shaft heated pugmill insures pressure "knading" action for superior blending action of warm concrete principle. Attains thorough coating of each particle—no dead spots. Allows lowest slump concrete.

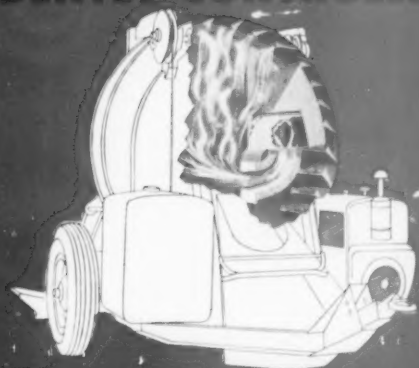
SIMULTANEOUS *Drying and Mixing*—

...BOTH CYCLES INDEPENDENTLY CONTROLLED

Independent control of drying and mixing, with both cycles operating simultaneously, achieves exactly the dryness and mixing time desired. This is vitally important to the successful production of high-type hot patch materials.

Hot patches are essential because: (1) they are less susceptible to the inroads of water; (2) they adhere more effectively to bituminous or concrete areas surrounding the patch; (3) they may be opened to traffic immediately—no curing period is required.

To get the best hot patch material, efficient drying is essential. The Micall provides a B-G rotary drum dryer, the most effective dryer. It enables you to gain the many benefits of using hot patch materials.



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**AT WHAT
YOU CAN DO**

MIX ALL QUANTITIES: from a single 300 lb. batch up to 5 tons per hour of hot mix—or up to 10 tons per hour of cold patch.

MIX IN ALL LOCATIONS: towed to the job by truck loaded with aggregate . . . fed directly from truck or from stock pile or pit. Works in a single traffic lane. No set-up time required.

MIX IN ALL WEATHER: heated aggregate makes low atmospheric temperature mixing possible—allows quick repair to prevent major failures.

MIX ALL TYPES: of bituminous materials including stabilized mixes—as well as low slump Portland cement mixes.

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The Micall is a unique
machine with its
own set of gears.

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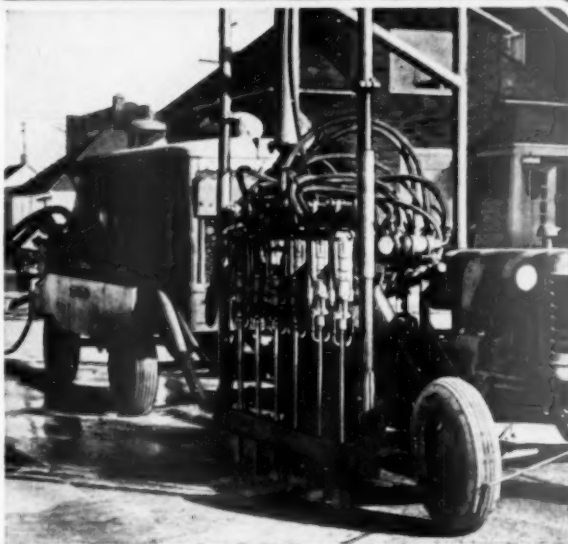
GM DIESEL

CASE HISTORY No. 5211-4

USER: R.L. Coolsaet Construction Co., Dearborn, Mich.

INSTALLATION: GM Diesel-powered Ingersoll-Rand 600 cfm rotary compressor replacing a 500 cfm compressor, supplies air to a tractor-mounted multiple drill—six drills 12" apart.

PERFORMANCE: Previous Diesel compressor supplied 75 lbs. of air to each drill and took time to build up pressure after each move. GM-powered compressor supplies steady 95 lbs., starts drills immediately and saves 20% in fuel costs. Unit drills 600 lineal ft. per day.



NEW GM DIESEL-POWERED RIG CUTS PAVEMENT-BREAKING TIME IN HALF

R. L. Coolsaet figures his pavement-breaking time is cut right in half with this rig when compared to the old way with one man on each drill. Now he drills six holes at once—gets twelve holes drilled in six feet and moves up for the next series, all in three minutes, and one operator handles the job.

This is another good example of how General Motors Diesel-powered equipment gets work done faster and reduces costs at the same time. Two-cycle operation

delivers a smoother, steadier flow of power—gives instant response to overcome sudden load changes. Simple design makes it easier to maintain—lower-cost parts make it cheaper to maintain. Add it up and you'll see why GM Diesels give you power at the lowest cost per horsepower hour—for any job.

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SINGLE ENGINES... 16 to 275 H.P. MULTIPLE UNITS... Up to 240 H.P.

It pays to standardize on.

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*E ditor's page

Tangible Benefits From Association Membership

THE MANY INTERPRETIVE LETTERS flowing out of the offices of the National Sand and Gravel Association and the National Ready Mixed Concrete Association bring out strikingly the ever-broadening influence that is being exerted, where associations have set out to accomplish the absolute maximum in service for their members and in the interests of the public welfare.

These two associations have the same executive secretary and engineering director. We accordingly refer to them as a single group for our purpose herein; which is to give recognition to an outstanding example of the extent to which the activities and accomplishments of an association can exceed even the greatest expectations of its founders.

In the early days, when the move was on to organize industry groups, the purpose was really nothing more than to instill good fellowship between companies and individuals with mutual interests. There were no real objectives and there was little worthwhile accomplished.

This association has carried its functions far beyond the majority. It has developed a technique of operations encompassing every conceivable subject of interest to its members, including commercial phases, and many of its activities are actually involved in helping to preserve our American system of free enterprise.

As we write this, the National Sand and Gravel Association has filed a brief before the Supreme Court of the United States and is prominently identified, in reports on the hearings of arguments before the Court, covering the application of the Wage and Hour Law to "off-the-road" employees of highway materials firms.

The association has been extremely active since the law was enacted in 1938, in filing briefs and by participation in litigation involving jurisdiction of the law, because of the important issues at stake for the sand and gravel industry. The issues of overtime payment are just as high for the other aggregates industries and for other businesses that supply materials for the repair and construction of highways and other means of transportation that enter into the interstate picture.

Back in 1946, in the case of E. C. Schroeder Co. v. Clifton, which was concerned with employees engaged in the production of crushed stone, the National Sand and Gravel Association made itself heard to good effect because it believed that there was an unwarranted attempt to twist the language of Congress around in such a way as to penalize a company where its products were not shipped

across state lines. It still believes that such interpretation, which would require overtime wages for employees engaged in producing materials so used, was not the intent of Congress as the law was written and later amended, and continues to carry the fight. It has made no difference whether the product involved be sand and gravel, crushed stone or ready-mixed concrete—because the decisions will be binding on all these industries.

The recent brief filed is a very comprehensive account of the history of the law and its interpretation, in support of petitions before the Court to reverse the decision in the case of Alstate Construction Co. v. Tobin. In that case it had been held by an Appeals Court that the Law applies to "off-the-road" employees engaged in the production of amiesite used for the repair and maintenance of interstate highways. The Court held that such employees are engaged in production for interstate commerce.

The foregoing is just one of many outstanding examples of what this group of producers is doing through its association for the welfare of its members and others concerned. The membership deserves a great deal of credit for its foresight in providing the funds for necessary legal counsel.

The association has been just as thorough and farsighted in keeping its members from legal and other pitfalls in its dealings with unions, and in advocating fair employer-employee relations that recognize the rights of the worker. It has a publication designed to assist members in working out sound agreements that is a masterpiece for fairness and good sense.

In addition, members are kept flooded with progress reports and detailed interpretive letters on all manner of legislative matters, on developments in the fields of zoning, depletion, research, and any other problems that enter the picture to affect the industry. Generally, the industry is kept informed of developments almost before they happen.

This association is the very heart throb of its industry and it would be difficult indeed to find a service that would yield so much return for the money spent in membership. Without services of the kind being accomplished, we often wonder about some of the conditions under which an industry might be compelled to operate.

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the greatest shovel improvement in 20 years.* It's smoother, faster, more dependable. It eliminates the old swing frictions with their constant headaches and replacement costs. Magnetorque lasts the life of your machine. You should know the facts about it!

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WELDING EQUIPMENT



OVERHEAD CRANES

Rocky's Notes

NATHAN C.
ROCKWOOD

Industrial uses of soluble silicates

THERE IS VERY CONVINCING evidence in Vol. 2 of Dr. James G. Vail's "Soluble Silicates in Industry" that alkali silicate chemistry is closely related to calcium silicate chemistry, at least in important respects. Vol. 1 of this work was reviewed in our December issue, with special reference to its interest for cement and concrete researchers. Vol. 2 is about twice as large in number of pages and contains an extensive compendium of the various uses of the alkali silicates in industry; and they are numerous and suggestive to any one interested in silicate chemistry in general, and that certainly should include all interested in research into the mysteries of portland cement and concrete.

It is true that scientific explanations of many of the properties of soluble silicates, when used in various ways with other materials, are still lacking. Yet it is evident that basically one is dealing with dispersed silica, as a sol, as a gel and as a solid, and that the properties of silica in these forms cannot vary much regardless of how we obtain the dispersed silica. That is, we may get silica thus dispersed in a solution of sodium silicate, from which the sodium ions can be removed by neutralizing with acid, or we can get silica dispersed by hydrating a tricalcium silicate, as found in portland cement clinker, but in either case the dispersed silica will exhibit the same properties. The chief of these properties is its ability to form a gel and subsequently "set" with inclusion of a tremendously varying amount of "water of hydration," only a small portion of which can be said to be really bound by ordinary chemical bonds.

Vol. 2 of "Soluble Silicates" begins where Vol. 1 left off at Chapter V. So, the second volume begins with Chapter VI, "Interfaces Modified by Silicate Solution," divided into three parts as follows: (1) silicate detergents and detergent mixtures; (2) application at inorganic surfaces; (3) at organic surfaces. With detergents we are not here so much concerned, although probably an expert in inorganic chemistry would find in the properties of these silicates much that

would serve as helpful clues to properties exhibited in any other application. Chapter VII deals with "New Surfaces: Coatings and Films," divided into two parts as follows: (1) on nonporous materials; (2) on porous materials. The terms are relative, of course, since absolutely nonporous materials are probably nonexistent. Chapter VIII is on "Bonded Surfaces," with parts (1) on adhesive cements; (2) on conjunctive cements; (3) on consolidated masses. Here we are getting into the field of hydraulic cements where the "mineral glue" in all cases appears to be derived from a silica sol, regardless of what its origin may be or how it is produced. We will return to this part later on.

Chapter IX deals with "Sols, Gels and Polymers in Industry." Sols are "colloidal" solutions; in the strictest chemical sense they are not true ionic solutions, but are more like suspensions of very fine particles which cannot be removed from the liquid by gravity. Polymers are aggregations of atoms or ions formed into connected groups, each of which has specific properties. The elements silicon resembles carbon in that it forms polymers in a similar manner, by strings, rings, etc. This chapter is important to all readers for it describes many properties and uses of silica gel, all of which have some bearing on the properties of the silica gel that is the heart of all hydraulic cements. The final Chapter X deals with "Physiological Behavior" of soluble silicates and is not of particular interest to our readers. As to the possibility that soluble silicates might cause silicosis when breathed as dry dust, our author is convinced that because they are readily soluble, the silica would be carried away from the lungs in the blood, since considerable amounts can be taken into the blood stream through the stomach or digestive system without harmful effects.

For Bonding Surfaces

Portland cement paste, if it is to serve its purpose, must be classed as an adhesive. It must hold heterogeneous aggregates together. Hence, the following quotation from Dr. Vail's treatise is fundamental: "All adhesives must form an intimate contact with the surfaces to be united. We

say surfaces must be wet. This fundamental factor has been extensively explored in recent years. It is primarily a chemical phenomenon. The surfaces of most materials are different from their interior structure because the balance of forces which exists within the mass is no longer possible at the surface where the molecules are under the influence of two different media. Residual forces cause adsorption of films of water and other oriented polar materials which completely alter the character of the surfaces with which the adhesive must form an intimate contact in order to perform its function. Even different cleavage planes of the same crystal may exhibit strikingly different surface phenomena. An essential corollary of this situation is the need to consider the polar characteristics of the adhesive."

The significance of that quotation becomes readily apparent when we study those silica particles, regardless of their size, which are freed when a soluble silicate is neutralized with an acid, or are freed in the hydration of the dicalcium and tricalcium silicates in portland cement clinker. Such particles are initially negatively charged. Hence a polar molecule of water, with the positively charged hydrogen ion or ions at one end, readily becomes attached to the newly exposed surface of the silica particle. Similarly the sodium end of a molecule of sodium hydroxide readily becomes attached to a silica particle, even more strongly than the hydrogen end of a water molecule. This, of course, is what constitutes a solution of sodium silicate. The negative charges on the silica particles thus become reversed and opposing positively charged sodium ions, attached to the silica surfaces, tend to repel each other, or to disperse the particles in the liquid medium. The extent of the dispersion depends on the strength of the sodium hydroxide solution, or the ratio of sodium to silica. A sodium silicate gel, and eventually a glass, can be formed by increasing the silica ratio or by removing some of the water; and a silica gel can be formed by some reagent that will remove most of the sodium and some of the water.

The following quotation also is enlightening: "Why do we use water glass [sodium silicate] as an adhesive and not a solution of silicic acid or silica gel? Colloidal silica does not have the sticking quality of a water glass solution. It ages because its free reactive hydroxyl groups react with themselves, thus increasing the molecular weight of the substance and decreasing its chemical reactivity. One of the requirements of a good adhesive is the presence of reactive groups under conditions which prevent these groups from reacting with themselves. The hydroxyl groups of a silica gel have a tendency to split off H₂O [water] and to form a permanent bond [between the groups]. This

(Continued on page 142)

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PEOPLE in the news

Traffic Manager

DANIEL T. WARNER, JR., has been appointed Chicago traffic manager of Universal Atlas Cement Co., New York, N.Y., succeeding Eric R. Gustafson, who has retired after almost 44 years of service with the company. Mr. Warner, who has been assistant to Mr. Gustafson, will be succeeded by George A. Smith, formerly chief clerk in the traffic department in New York. Mr. Warner joined Universal Atlas in 1946 at Dayton, Ohio, as traffic representative and in 1950 was made chief clerk at the Birmingham, Ala., sales office. A year later, he returned to Dayton as traffic representative and in 1952 was appointed assistant traffic manager in Chicago.

Mr. Gustafson joined the traffic department of Illinois Steel Co., Chicago, in 1909, and subsequently became chief clerk. In 1930, he was made assistant traffic manager of Universal Atlas Cement Co., Chicago, where he remained until his appointment as traffic manager in 1938.

On Board of Directors

TOM MACNIDER has been elected to the board of directors of Northwestern States Portland Cement Co., Mason City, Iowa, to fill the vacancy caused by the resignation of Charles E. Strickland. Mr. MacNider, who was also named assistant to the president, is the son of Hanford MacNider, president of the firm. Officers re-elected are: Hanford MacNider, president and general manager; B. A. MacDonald, vice-president and assistant general manager; E. C. Frudden, vice-president; Peter Anderson, secretary-treasurer, and Glen L. Leaman, assistant treasurer. Frank Pirkel was elected assistant secretary.

Named Vice-President

CHESTER B. LOCKLIN has been named vice-president and chief engineer of Marble Face Blocks, Inc., New York, N.Y. He was formerly manager of the Kenilworth plant. John J. Reilly has been promoted from assistant sales manager to sales manager.

Heads Silo Association

HOMER PETERSON, owner and manager of the Rockite Silo Co., Hutchinson, Minn., was elected president of the Concrete Stave Silo Association at a recent meeting in Minneapolis. He has been a member of the association since 1942, which comprises silo manufacturers of Minnesota, North

and South Dakota, Iowa and Wisconsin. Its membership also includes silo roof manufacturers and manufacturers of silo accessories. Mr. Peterson also operates the Belle Plaine Silo and Block Co., Chaska, Minn.

Gypsum Speaker

L. A. PURCELL, works manager at the Southard, Okla., plant of the United States Gypsum Co., Chicago, Ill., was guest speaker at a recent meeting of the Okeene Kiwanis Club, Okeene, Okla. Mr. Purcell, who recently succeeded M. E. Davidson as works manager at Southard, gave a brief history of the gypsum industry.

Heads Limestone Division

HUGH S. LEWIS has been elected president of the Michigan Limestone Division of the U.S. Steel Corp., Detroit, Mich. He was formerly executive vice-president and succeeds Irvin L. Clymer, who has retired. Mr. Lewis is a native of Madison, Miss., and graduated from the University of Mis-



Irvin L. Clymer

engineer and was elected vice-president of both companies in 1938 and president in 1939.

Research Director

W. L. NEWHALL has been appointed director of the department of research and development for Dravo Corp., Pittsburgh, Penn., and subsidiaries. C. R. Horton, Jr., and A. J. Liebman have been named assistant directors. A graduate of Massachusetts Institute of Technology, Mr. Newhall has been with the company since 1925. He was formerly assistant general manager of the engineering works division.

Heads Minerals Separation

DAVID E. LILIENTHAL, formerly director of the Tennessee Valley Authority, has been appointed president of Minerals Separation North American Corp., Lakeland, Fla. He succeeds Dr. Seth Gregory, who has been with the company for 25 years and who will continue as a consultant.

Elected a Director

HULBERT S. ALDRICH has been elected a director of Penn-Dixie Cement Corp., New York, N.Y., to succeed Charles J. Stewart, who has resigned. Mr. Aldrich is president of the New York Trust Co.

Vice-President Retires

CARL G. MUENCH has retired as senior vice-president of The Celotex Corp., Chicago, Ill., but will continue as a director.



Hugh S. Lewis

issippi in 1922 with a degree in engineering. He joined the engineering department of Michigan Limestone and Chemical Co. in 1926 and became chief engineer in 1940. Two years later he was appointed operating engineer. In 1945 he was made vice-president of operations and in 1952 became executive vice-president.

Mr. Clymer has been president since 1939. He is a native of Mt. Cory, Ohio, and a graduate of Purdue University. He joined Michigan Limestone and Chemical Co. and Bradley Transportation Co. in 1926 as chief



Webster L. Kaiser



H. Lyle Henson



Merko M. Sepic

Peerless Vice-Presidents

A. C. EICHENLAUB has been appointed vice-president and operating manager of Peerless Cement Corp., Detroit, Mich. He was formerly executive assistant to the vice-president in charge of manufacturing. Mr. Eichenlaub joined the company in 1929 as assistant chief chemist.

H. Lyle Henson has been named vice-president in addition to his duties as chief engineer. He has been with the company since 1936 when he started as a service engineer in the sales department.

Merko M. Sepic, secretary-treasurer, has also been appointed vice-president. He joined the company in 1928 as an accountant.

Webster L. Kaiser has resigned as vice-president in charge of manufacturing but will continue to serve the company as special consultant.



A. C. Eichenlaub

ager of plaster and lime products, has been promoted to merchandise manager of the insulation division. J. D. Sheldon, formerly manager of the Harrisburg, Penn., district, has been appointed district sales manager of the Cleveland office. Lorin Purcell, mechanical superintendent at the Sweetwater, Texas, plant for the past nine years, has been promoted to works manager of the Southard, Okla., plant.

Named Vice-Presidents

DAYTON L. PROUTY, Daniel J. Boone and Joseph A. Kelley have been named vice-presidents of the Zonolite Co., Chicago, Ill. Mr. Prouty, who has been with the company for 16 years, is manager of the North Central division, with headquarters in Dearborn, Mich. Mr. Boone, who joined Zonolite in 1944, is manager of the merchandising division in Chicago. Mr. Kelley manages the Southern division, with mining and processing headquarters at Travelers Rest, S.C. He has been with the company for six years.

Appointed Superintendent

JAMES C. GRIFFIN has been named superintendent of the Des Moines, Iowa, plant of Marquette Cement Manufacturing Co., Chicago, Ill. He was formerly assistant to the superintendent and succeeds J. C. Bennett who has been in ill health for some time but will serve on special assignments with the operating department. Mr. Griffin joined the Des Moines plant in 1937 and served in various departments before his appointment as assistant to the superintendent in 1946.

Discuss Concrete on Farm

W. J. HAGENLOCHER and J. R. Snowball, engineers for the Portland Cement Association in Ohio, recently conducted a technical discussion on concrete on the farm at a meeting of Stark County, Ohio, farmers. Before the discussion, a color motion picture, "How to Mix and Use Concrete on the Farm," was shown. The program was sponsored by the Agricultural Extension Service.

Manager Retires

JOHN P. PEACOCK, manager of the stone and slag division of Bethlehem Steel Co., Bethlehem, Penn., has retired after 35 years of service in the raw materials division, mainly in the limestone producing units. He is succeeded by H. T. McIlwain, general superintendent of the Bridgeport and Hanover quarries and the foamed slag plant at Sparrows Point, Md.

Heads Advertising Services

ROBERT F. QUINN has been appointed manager of advertising services of the National Gypsum Co., Buffalo, N.Y. He was formerly advertising manager of Pittsburgh Corning Corp., Pittsburgh, Penn., and has spent nearly ten years in the advertising and sales promotional fields.

Named Secretary

HARRY H. MITCHELL has been appointed secretary and corporation counsel of Lehigh Portland Cement Co., Allentown, Penn. He replaces K. J. Schatzlein, who has retired. A native of Hartford, Conn., Mr. Mitchell has been assistant secretary since December 1, 1952. Before that he spent 16 months in Washington, D.C., as deputy officer in charge of the Property Affairs Division, Bureau of German Affairs, and held various government posts in Germany. He was graduated from Yale University, where he was awarded a Rhodes Scholarship, and Yale Law School.

U. S. Gypsum Promotions

KENNETH R. ECKROTE has been appointed operations manager in the Eastern region of United States Gypsum Co., Chicago, Ill., and John W. Bledsoe has been named production manager in the Central division. Robert N. Avery, formerly sales man-

Heads Boy Scouts' Council

WILLIAM P. LEAKE, vice-president of the Louisville Cement Co., Speed, Ind., has been elected president of the George Rogers Clark Area Council of Boy Scouts. Born in Louisville, Ky., Mr. Leake became a Charter member of Troop 23, one of the oldest troops in the city. He joined Louisville Cement Co., in 1937, spent a short time at Speed, Ind., and was then made superintendent of the Milltown, Ind., plant. He renewed his interest in Scouting and in 1937 was elected vice-chairman of the combined Crawford and Harrison County district. When the two counties separated, Mr. Leake was elected chairman of the Crawford district, and later became a member of the Area executive board. In 1948, Mr. Leake returned to the plant at Speed, Ind., in an executive capacity, and since that time has served the Scout Council as activities chairman, organization and extension chairman and chairman of the jamboree committee. For the past two years he has been Council vice-president.

Assistant to President

EARL C. FAULKNER, formerly general sales manager of the United States Gypsum Co., Chicago, Ill., has been appointed assistant to the president of the Lehigh Co., Chicago, manufacturers of asphalt roofing materials, paper products and related asphalt items for industrial uses. Mr. Faulkner has been active in the building materials field for 25 years. He resigned from the U.S. Gypsum Co. in May, 1951, after 21 years of service.

Director of Safety

ROBERT W. McELROY has been appointed director of safety and security for Minnesota Mining and Manufacturing Co., St. Paul, Minn., and its subsidiaries. He was formerly plant protection manager, Jerome M. Mayer, who has been safety engineering inspector since 1945, has been named manager of fire protection.

Products Manager

THOMAS H. EATON has been named manager of the industrial products plant of Johns-Manville at Marrero, La. He succeeds R. B. Murphy, who has retired. Stanley E. Stumpf continues as manager of the building products plant at Marrero.

Named Vice-President

JAMES W. PASTORIUS has been appointed vice-president of the Whitehall Cement Manufacturing Co., Philadelphia, Penn., according to an announcement by R. A. Wetzler, president. Mr. Pastorius joined the Cemen-

ton plant in 1936 as design engineer and two years later was made plant engineer. He was appointed superintendent in 1945 and became plant manager in 1951, at which time he succeeded Arnold Hoke, plant manager and vice-president, who retired after 40 years of service. Mr. Pastorius is a registered professional engineer and a member of the National Society of Professional Engineers, past president of Lehigh Valley Chapter of Pennsylvania Society of Professional Engineers and a past president of the Lehigh Valley Section of the American Society of Civil Engineers.

Geologist

HENRY E. REED, JR., has been appointed assistant geologist for the mineral development department of the Great Northern Railway Co. at Williston, N.D.

OBITUARIES

RAY V. WARREN, executive secretary and engineering representative of the Western Pennsylvania Sand and Gravel Association since its formation in 1929, died suddenly on December 26. He held the same position in the Ready-Mixed Concrete Association of Metropolitan Pittsburgh since its formation in 1933. Mr. Warren also served as secretary-treasurer of the Pennsylvania Sand and Gravel Producers' Association for ten years. For a period of about ten years he held the position of township engineer of the Pennsylvania Department of Highways and also served several years as Road Commissioner of Allegheny County. Mr. Warren had been an associate member of the American Society of Civil Engineers since 1915, becoming a life member in 1950, and a member of the American Concrete Institute since 1930.

CHARLES S. DICKSON, president of the Standard Sand and Gravel Co., Wheeling, W. Va., passed away December 20 after a short illness. He was 57 years of age. Born in Pittsburgh, Penn., Mr. Dickson moved to Wheeling, W. Va., 25 years ago to become associated with the late W. H. Klieves in the sand and gravel business. He was a member of the Wheeling Planning Commission and a former vice-president of the Ohio Valley Board of Trade. Mr. Dickson was also a director of the National Sand and Gravel Association.

WILMER H. GEMMER, chairman of the board of the Texas Construction Material Co., Houston, Texas, and father of E. P. Gemmer, president, passed away December 22. He was 81 years old. Mr. Gemmer had been active in the sand and gravel business since 1919. Born in Williamsport, Ind.,

he graduated from Purdue University in 1894 as a civil engineer. Following his graduation he was county engineer of Warren County, Ind., until 1909, when he moved his family to Houston, Texas. He joined the Wm. P. Carmichael Co. and later became manager of Horton & Horton, building material firm in Houston. In 1920, with John A. Tanner of Columbus, Texas, Mr. Gemmer organized the firm of Gemmer & Tanner, gravel producers operating quarries in Colorado County. Nine years later he helped consolidate five gravel companies, one of which was Gemmer & Tanner, into the Texas Construction Material Co. Shortly thereafter he retired from active participation in the business.

J. THOMAS REES, former designing engineer for Lehigh Portland Cement Co., Allentown, Penn., died December 10. He was 68 years old. A native of Hokendauqua, Penn., Mr. Rees graduated from Lehigh University with a degree in mining engineering. For a number of years following his graduation, he was with the Braden Copper Co., developing mines in Chile, South America. Upon his return to the United States, he joined Lehigh Portland Cement Co. For the past four years Mr. Rees has been associated with Kennedy-Van Saun Manufacturing and Engineering Corp., Danville, Penn., designing mining and cement manufacturing machinery.

J. A. JARDINE, former president of the Concrete Sectional Culvert Co., Fargo, N.D., died September 15 at the age of 72. Mr. Jardine started his career in the concrete pipe business in 1914 and established plants at Fargo, Grand Forks and Devils Lake, N.D. His son, J. B. Jardine, who was a director of the American Concrete Pipe Association in 1946-1947, heads the firm.

DWIGHT W. LONGFELLOW, co-founder and one of the principal owners of The Cretex Companies, Inc., Miami Beach, Fla., passed away November 28 after a short illness. He was 67 years old. Mr. Longfellow had been in the concrete pipe business since 1917 and was well known by concrete pipe manufacturers from Coast to Coast. He had been living in Miami Beach since 1940.

FRANK HOUGHTEN, retired concrete block manufacturer and builders' supply dealer, Detroit, Mich., died January 2. He was 78 years old.

THOMAS C. ROGERS, president of the Pacific Rock and Gravel Co., Monrovia, Calif., died December 29 at the age of 65.

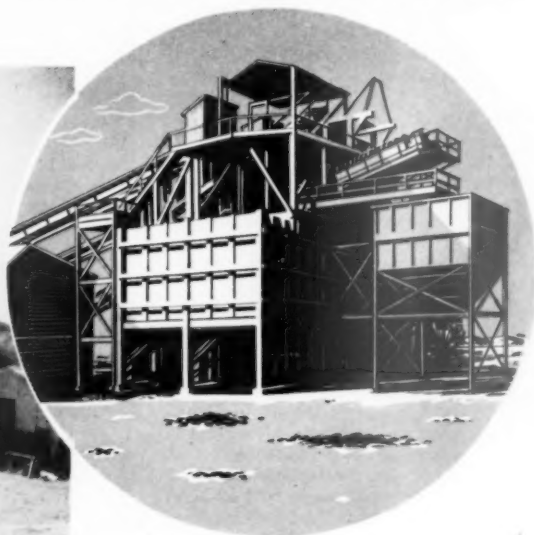
JOSEPH C. ROVENSKY, a director of the Lone Star Cement Corp., and the Massey Concrete Products Co., New York, N.Y., passed away December 17 after a brief illness. He was 66 years old.

FOR MORE PROFITABLE OPERATION...

Get a WKE designed sand and gravel plant



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Profitable sand and gravel operations in today's competitive market require plants of high productivity and efficiency. Western Knapp Engineering Company, a division of Western Machinery Company, offers you a wealth of experience in the design and construction of such high profit plants—plants that pay off because they were planned and equipped to produce better specification aggregates at lower cost.

WKE service is all-inclusive from analysis of aggregate samples and plant design to materials procurement, equipment installation and initial plant operation. WKE's extensive purchasing facilities are capable of providing any type of equipment and supplies required by design or customer preference.

As a WKE client, you will also benefit from the facilities of Western Machinery Company, a leading supplier of crushing, washing, screening and material handling plants. In addition, Western Machinery manufactures a well-known line of aggregate processing equipment. Included in the Wemco line are Sand Preparation Machines, Attrition Machines, Sand Pumps, Hydro-separators and Thickeners.

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LABOR RELATIONS TRENDS

**Collective bargaining on company-owned house rents
New highway construction not under F.L.S.A.**

By NATHAN C. ROCKWOOD

NUMEROUS PLANTS in the rock products industries are removed from population centers and employee housing problems have always been present—probably not so much now in the days when every worker owns an automobile as prior to this era. Hence, many operators found it necessary to supply housing facilities, usually at nominal rentals. The question arises, does the employer have to include rentals, use and condition of these company-owned houses in collective bargaining with its employees? According to a recent decision of the National Labor Relations Board it is a violation of the National Labor Relations Act if it refuses to do so.

The issue was raised by Local 167 (A.F. of L.) of the United Cement, Lime and Gypsum Workers International Union in a dispute with the Lehigh Portland Cement Co. and the management, of its Fordwick, Va. plant. A panel of the N.L.R.B., consisting of Messrs. Herzog, chairman, Houston and Murdock, members, made the following decision on November 24, 1952:

"Of the 65 dwelling units owned by the employer, 50 are rented to employees in the bargaining unit, ten are rented to employees outside the bargaining unit, and five are rented to non-employees. Of these five dwelling units, three are occupied by former employees, one is occupied by the mother of an employee, and one is leased to a non-employee who sublets it to an employee with the employer's approval. These company-owned dwellings are located within a radius of one mile of the plant.

"Of the total number of employees, 131 own their homes within a 1- to 20-mile radius of the plant, and 57 employees rent private housing within a 1- to 35-mile radius of the plant.

"The terms of the lease for these company-owned dwellings support the conclusion that company-owned housing is an integral part of the employment relationship. The lease provides in part that the employee agrees in renting a company-owned dwelling 'to do such work as he may be directed to do by the employer, or any of its authorized assistants, at or about any of the plant facilities or farms or any other premises belonging to the employer, at the rate of wages that are or may be established for the different kinds of work by the employer.'

"Maintenance and repairs of company-owned dwellings are taken care of by the employer's department of valuation and property. The amount of rent varies with the size of the unit and with the conveniences within the unit. Some employees pay their rent in cash; the majority, however, have rent deducted from their pay check after having given the employer a written authorization for such deduction.

"On March 30, 1951, the employer announced a rent increase to take effect May 1, 1951.

"At a meeting held to process grievances on April 9, 1951, the employees submitted a document reading as follows:

"We, the undersigned protest to company's action in raising the rent in the company-owned houses. This is in reality a pay cut, and since the matter of rental in company houses is subject to collective bargaining, we request the company to return the overcharges to each individual and take the matter of house rentals up with the union before any other action is taken."

"The employer advised the employees that rental of company-owned dwellings was not a matter for collective bargaining and refused to discuss it. When the meetings between the union and the employer to process grievances were held, the subject again was brought up by the union and the employer informed the union that it did not consider rental of company-owned dwellings a matter for collective bargaining.

"The matter of the use and condition of company-owned dwellings was taken up by the union on June 15, 1951, and again in a letter of July 21, 1951. The employer stated to the union that such matters were handled by its department of valuation and property and thereafter refused to bargain on both subjects.

"The employer contends that company-owned houses are not a proper subject for bargaining unless it can be shown that certain additional circumstances exist, as for example, that company houses are a necessary part of the enterprise and that they are rented at such rates to employees as to represent a substantial part of the remuneration. In support of this contention the employer cites N.L.R.B. vs. Hart Cotton Mills, 190 F. 2d 964. This contention is without merit.

"While the employer does not require its employees to live in company-owned dwellings, the employer nevertheless has been providing such dwellings to a part of its working staff since it acquired the plant and property in 1919, and at nominal rentals. Furthermore, housing in the area is scarce. As a result of these circumstances, the employees are necessarily obliged to live in company facilities if they are to work at the plant.

"The privilege of living in a company-owned dwelling represents an 'emolument of value' in that it saves employees expense of transportation if they had to live elsewhere. Accordingly, the living accommodations provided by the employer are encompassed within the term 'wages' within the meaning of the N.L.R.A.

"Like the trial examiner we conclude that in this case the rental of the company-owned houses was a matter included among the conditions of the employees' employment and bargainable as a condition of employment, whether or not it is treated as included within the term 'wages' as used in Section 9(a) of the Act. We do not disagree with the trial examiner in finding that such subject matter is properly considered within the term 'wages.'"

"Order: Cease and desist from refusing to bargain with union with respect to rental of company-owned houses or other conditions of employment and making any unilateral changes in rentals of company-owned houses affecting the employees in the bargaining unit without prior consultation with union. Upon request, bargain with union with respect to any changes in rentals of company-owned houses occupied by employees in the bargaining unit; post notice."

Ruling on Interstate Commerce

A decision of the U.S. Circuit Court of Appeals, Sixth Circuit (Cincinnati, Ohio) will probably have some bearing on the cases now on appeal to the U.S. Supreme Court to define the application of the Fair Labor Standards Act to workers employed by aggregate and ready-mixed concrete producers who provide construction materials for highways and pavements. The case reported here involves the application of the law to a watchman employed by a contractor on the construction of a new highway which will carry interstate traffic when completed. The text of the court's decision, in part, is as follows:

"The question presented by this appeal is whether the building of a highway located entirely within a single state, newly constructed upon a right-of-way which runs through an area where no highway has theretofore existed, constitutes 'commerce' or the 'production of goods for commerce' within the meaning of the Fair Labor Standards Act of 1938, as amended, 29 U.S.C. § 201 et. seq. From October

(Continued on page 136)

AGED BUT ACTIVE. Eight-year old TD-14 and dozer cleans top of 16-foot seam of asphaltic limestone, plays its part in maintaining 200,000-ton annual production.



Keeping off the **ROCKS** at Margerum

Alabama Asphaltic Limestone Company began profitable operations by switching to International Crawlers in 1945

In 1945 the Alabama Asphaltic Limestone Company, due to the high cost of handling materials with steam cranes and clamshells, switched to the use of fast and flexible International crawler tractors, a conversion that helped put production on a profitable basis.

Four International TD-18As and TD-14As now speed materials handling.

S. E. Neill, vice president, reports:

"Production now runs 200,000 tons of finished product annually, and we are supplying road builders all over the Southeast. Our equipment orders specify nothing but International crawlers and IH engines for our compressors."



FLEXIBLE EQUIPMENT. The same TD-14A crawler dozes crushed asphaltic limestone away from the conveyor belt to a 35,000-ton stockpile. Both cold mix (ready-to-lay material) and pulverized Asphaltic Limestone for hot mix paving material (black top) is used on roads throughout southeastern section of the country.



STOCKPILING SAND. Sand that is unloaded from hopper bottom cars is pushed up on the stockpile and also into the hopper at the mixing plant by a TD-14A and dozer.

If materials handling costs are eating into your income, call your International Industrial Distributor for practical suggestions. International "Power that Pays" will help keep the profit in your pockets.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

POWER THAT PAYS



INTERNATIONAL

industry news

Canadian Cement Expansion

CANADA CEMENT CO., LTD., Montreal, Quebec, which produces over 80 percent of the total Canadian output of portland cement, is presently completing an expansion program which will boost capacity to 17,500,000 Canadian bbl. of cement annually. This is an increase of approximately 75 percent since the end of World War II. During 1951, capital expenditures for expansion purposes amounted to \$9,879,932. It was estimated that an additional \$12,000,000 will be required to complete the expansion program. Operating profits have been rising steadily since the end of the war. Profits for 1951 totaled \$15,275,952, compared with \$7,057,635 in 1946.

Silica Sand Expansion

SPRINGDALE SILICA SAND CO., Springdale, Wash., which began operations of its new silica sand processing plant in July, 1952, has now started an expansion program designed to triple plant output. Present capacity is 100 tons per day. New equipment will include four conveyors, three sizing screens and a 58-ft. long dryer. Sandstone, said to be 99 percent pure silica, is mined by open-pit methods at Lyon's Hill, eight miles west of Springdale. The company is headed by Frank Eichelberger and J. W. Melrose.

Gravel Plant

LAYOS SAND AND GRAVEL CO., Green River, Wyo., has started production of sand and gravel. It will produce 70 t.p.h. of sand and gravel. Michael Layos, Jr., is manager.

Scholarship Fund

LEHIGH PORTLAND CEMENT CO., Allentown, Penn., has announced the establishment of a \$20,000 scholarship

fund for students at Lehigh University, Bethlehem, Penn. The agreement accompanying the gift stated that the company recognized "the need of business and industry for broadly trained men from which it can draw its professional, administrative and executive personnel" and "that this need can best be met through higher education offered in private schools of broad cultural background with modern facilities." The new fund, to be known as the Lehigh Portland Cement Scholarships, will be administered through the regular university committee on scholarship grants.

P.C.A. Group Visits Ideal Cement Plant

THE TECHNICAL PROBLEMS COMMITTEE of the Portland Cement Association held a recent meeting at Denver, Colo. The highlight of the meeting was a tour of Ideal Cement Co.'s new cement plant at Portland, Colo. The accompanying pictures show the group inspecting the plant.



Primary crushing plant

Mining Levy Defeated

A PROPOSED 1 PERCENT TAX LEVY ON mineral resources depletion in Arizona was recently removed from the ballot by the Arizona Supreme Court which ruled that the initiative proposal lacked adequate valid signatures. The new tax, which was proposed as revenue for a public employee's retirement fund, would have been in addition to a 1 percent levy already in force on mining and would have applied to all mined or quarried products. Arizona Sand and Rock Co., Phoenix, led the opposition to the initiative proposal, upon whose protest the Supreme Court acted.

Aggregate Plant

DALLAS LIGHTWEIGHT AGGREGATE Co., an affiliate of Texas Industries, Dallas, Texas, has started production of Haydite at its new \$500,000 lightweight aggregate plant. The company recently purchased a 125-acre shale deposit which will be the supply source for the aggregate plant. The Haydite will be utilized by the company's Texcrete plant near Dallas for the production of lightweight concrete block.

Limestone Plant

COLUMBIA RIVER LIME Co. has begun production of agricultural limestone at its new plant near Ilwaco, Wash. Plant capacity is approximately 350 tons per day. John Herb, Vancouver, Wash., and Sam Gregson, Oregon City, Ore., are the owners and operators.

Gypsum

EUWANEE GYPSUM PRODUCTS Co. has started production of gypsum at a location 30 miles west of Albuquerque, N.M. Jim Scott of Santa Fe, N.M. and John Kime of Chilili, N.M. are partners in the firm.



Left: Part of the group of cement manufacturers on inspection tour. Center: Group inspecting bowl-rake classifiers. Right: Group observing quarrying and loading operations

Mica for Government

A GOVERNMENT PURCHASING DEPOT for high-grade mica is being established at Franklin, N.C. The new purchasing station is similar to the ones being operated at Spruce Pine, N.C., and Custer, S.D., and will be operated by the Emergency Procurement Service of General Services Administration for the Defense Materials Procurement Agency. Incentive prices will be paid in order to encourage exploration, development and production of domestic mica. Information concerning specifications and price schedules may be secured from General Services Administration Regional Office, 620 Postoffice and Court House, Boston 9, Mass.

New Crushing Plant

BLAKE BROTHERS Co., Richmond, Calif., producer of crushed stone, ready-mixed concrete, rip rap and asphalt mixture, is building a \$250,000 crushing plant at its quarry site. The company has a 6-mile system of conveyor belts to carry the boulders from the quarry to the crushing plants and bins. The 4-yr. old concrete plant produces 250 to 300 tons of concrete per day. Ten transit-mixer trucks deliver the concrete throughout the Bay area.

Phosphate Mining

ARMOUR FERTILIZER WORKS is completing plans for mining phosphate rock on its property near Bartow, Fla., as recently announced by John E. Sanford, president. The mining project will include a processing plant with washing, flotation, drying, grinding, storage and shipping facilities. The phosphate will be used in the company's triple-superphosphate plant at Bartow and in its other manufacturing plants throughout the country.

Reopen Lime Plant

THE LIMESTONE QUARRY at Hollister, Calif., will be reactivated according to Archie E. Hamilton, who recently purchased the property. The quarry is six miles from Mr. Hamilton's dolomite plant near the Westvaco dolomite mine. A new rotary kiln is being installed and two kilns in the plant will be reactivated. Full production is not expected for several months.

Slag Cement

IN EUROPE, the amount of cement made from finely ground slag with some gypsum and a small amount of portland cement as activating agent, seems to be increasing. This cement does not seem to acquire early strength as quickly as portland cement, especially at low temperatures. However, when the temperature rises again the reactions proceed in a nor-

mal manner and concrete made from this cement eventually becomes stronger than that made from portland cement, according to G. Pohl, as reported in *Zement-Kalk-Gips*, July, 1952, p. 219.

Unload Steamer in Record Time

MICHIGAN LIMESTONE AND CHEMICAL Co., Division of U.S. Steel Co., Detroit, Mich., recently set a new record when its steamship, the John G. Munson, unloaded 22,000 tons of limestone at the rate of 5000 t.p.h. This self-unloading vessel is equipped with a new-type bucket elevator which uses cable instead of chain and is claimed to reduce unloading time by as much as one-third.

Pavement Yardage

AWARDS OF CONCRETE PAVEMENT for the month of November and for the first eleven months of 1952 are listed by the Portland Cement Association as follows:

	Sq. yd. awarded	
	During November 1952	During first eleven months 1952
Roads	2,775,184	27,019,483
Streets and alleys	1,453,594	25,809,478
Airports	445,921	9,636,710
Totals	4,674,699	62,465,671

Sells Feldspar Mine

UNITED FELDSPAR & MINERALS CORP., subsidiary of American Encaustic Tiling Co., Lansdale, Penn., recently sold its feldspar mine and plant at Oxford, Maine, to Bell Minerals Co., of Kentucky.

Plant Expansion

NORTH STAR CEMENT Co., Toronto, Canada, is undergoing a \$1,000,000 extension and improvement program at its new operation at Humbermouth, Canada.

Portland Cement Production

THE PORTLAND CEMENT INDUSTRY produced 22,048,000 bbl. of finished cement in November, 1952, as reported to the Bureau of Mines. This was an increase of 6 percent compared with the output in November, 1951. Mill shipments totaled 19,771,000 bbl., an increase of 10 percent over the November, 1951, figure, while stocks were 11 percent below the total for the same month in 1951. Clinker production during November, 1952, amounted to 22,028,000 bbl., an increase of 4 percent compared with the corresponding month of the previous year. The output of finished cement during November, 1952, came from 155 plants located in 37 states and in Puerto Rico. During the same month of 1951, 20,737,000 bbl. were produced in 153 plants.

Cement Plant Sold

PREMIER SMALLWOOD of Newfoundland, Canada, announced that the government-financed cement plant at Cornerbrook has been sold to Canadian Machinery and Industry Construction Limited. He did not disclose the price but said the new owners were making a cash down payment and would pay 4 3/4 percent interest on the purchase price, plus the cost of a 3 percent annual sinking fund.

Adds Grinding Mills

MISSOURI PORTLAND CEMENT Co. is adding a 2-compartment finish-grinding mill to its Sugar Creek, Mo., plant, as a part of its modernization and expansion program. The accompanying illustration shows the 179,000 lb. shell of the 9-ft. 6-in. x 32-ft. Nordberg ball mill which will be installed in closed circuit with a 16-ft. dia. Sturtevant mechanical air separator. A 10-ft. 8-in. x 16-ft. ball mill was shipped to the Sugar Creek plant in August, 1952. It is now being installed for raw grinding.



Shell of 2-compartment finishing mill to be installed in closed circuit with a 16-ft. mechanical air separator

Safety Record

HURON PORTLAND CEMENT CO.'S Alpena, Mich., plant recently completed its 3,000,000th man-hour of operation without a lost-time injury. The present safety organization was established at the Alpena plant in January, 1949. Enthusiastic cooperation among all employees brought about immediate results. Prior to 1949, an average of ten accidents per year were suffered, a frequency rate of over six accidents per million man-hours. During the first three years of the new safety program, the accident frequency rate dropped to about one accident per million man-hours and, since February, 1951, the plant has operated more than 3,000,000 man-hours without a lost-time accident.

Sales Division

ARMCO COAL AND STONE PRODUCTS is a new sales division recently established at Middletown, Ohio, by Armco Steel Corp., as an outlet for Armco's by-products and other accessory materials, including agricultural limestone, flux stone, whiting, crushed stone, coal, coke, and coal chemicals. The new department is headed by George C. Brecht, manager, and Howard Holtzclaw, assistant manager.

Quarry Men Honored

LLOYD AND GEORGE ED KERFORD, Atchison, Kan., were presented with the distinguished service award for "contributing to the general economic welfare of Kansas for 50 years or more" by Harry Stevens, president of the Kansas Industrial Development Commission. The award, signed by Governor Ed Arn, was presented in the name of Kansas to the Kerford Quarry Co.

Fluorspar Discovery

DISCOVERY of important deposits of acid grade fluorspar on the Crystal Cluster and Broken Halter group of claims in the Primitive Area of the Salmon River canyon in Idaho has been reported by A. P. Smothers of Shoup. Deposits are 20 mi. from the nearest forest service road.

Vermiculite Plant

AMERICAN VERMICULITE CO., Spruce Pine, N.C., is building a new vermiculite processing plant near Woodruff, S.C. R. M. Biddle is general manager of the company.

Huron Expansion

HURON PORTLAND CEMENT CO. has started construction of a new mill building as part of the expansion of its Alpena, Mich., plant.

The expansion program includes the addition of four new kilns which will

be duplicates of the two installed in 1950. Each kiln will be equipped with a waste heat boiler, an economizer and an electrical precipitator. The raw and finish grinding departments will also be expanded. Present schedules call for the finish grinding equipment to begin operation next spring and the new kilns and raw grinding department to be completed in the fall of 1953.

A.S.T.M. Specifications

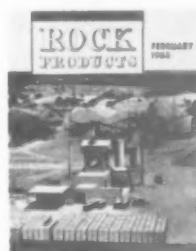
AT A RECENT MEETING of the administrative committee on standards of the American Society for Testing Materials, the following specification revisions were recommended: revisions in tentative specifications for air-entraining portland cement; revisions of tentative specifications for mortar for unit masonry to include a portland cement-masonry cement mixture; and revisions in tentative specifications for materials for soil-aggregate sub-base, base and surface courses.

New Asbestos Plants

NEW ASBESTOS PROCESSING PLANTS, to cost approximately \$25,000,000, are to be built within the next two years at Thetford Mines, Quebec, as announced by Paul Dumontier, counsel for three asbestos mining firms—Asbestos Corp., Ltd., Bell's Asbestos Corp. and Johnson Mines, Ltd. It was not revealed which of the companies would build the plants.

Cover Picture

ON THIS MONTH'S COVER is shown the Chillicothe, Ohio operations of New York Coal Sales Co., Columbus,



Ohio. Concrete block, ready-mixed concrete and sand and gravel are produced at this location. This operation typifies the very diverse activities of this concern which has seven major divisions

at various locations producing portland cement, crushed stone, agricultural limestone, sand and gravel, concrete products, ready-mixed concrete and bituminous concrete.

Sponsors Contest

MINERAL PRODUCTS CO., Kansas City, Kan., is sponsoring a contest for architectural and engineering students at the University of Kansas, Lawrence, Kan. A prize of \$200 will be awarded for the best paper submitted on the use of lightweight aggregate. The contest is to be an annual affair.

Sand and Gravel Plant

SOUTHWEST SAND AND GRAVEL CO. has begun operations at its new plant near Alamogordo, Kan.

Coming Conventions

February 23-26, 1953—

National Sand and Gravel Association, 37th Annual Convention, Fairmont Hotel, San Francisco, Calif.

February 23-26, 1953—

National Ready Mixed Concrete Association, 23rd Annual Convention, Fairmont Hotel, San Francisco, Calif.

February 25, 1953—

American Concrete Pressure Pipe Association, 4th Annual Convention, Baker Hotel, Dallas, Texas.

February 26, 1953—

American Concrete Agricultural Pipe Association, 3rd Annual Convention, Baker Hotel, Dallas, Texas.

February 26-28, 1953—

American Concrete Pipe Association, 45th Annual Convention, Baker Hotel, Dallas, Texas.

March 1-3, 1953—

Autoclave Building Products Association, 47th Annual Convention, Jefferson Hotel, Richmond, Va.

March 2-6, 1953—

American Society for Testing Materials, Spring Meeting, Statler Hotel, Detroit, Mich.

March 4-5, 1953—

Iowa Agricultural Limestone Association, 8th Annual Convention, Savery Hotel, Des Moines, Iowa.

March 19-20, 1953—

Indiana Mineral Aggregates Association, Annual Convention, Claypool Hotel, Indianapolis, Ind.

HH HINTS and HELPS

PROFIT-MAKING IDEAS DEVELOPED BY OPERATING MEN

Reducing Dust

AT THE PLANT of Kingston Trap Rock Co., Kingston, N.J., the primary crusher discharge, containing a high percentage of fines, is elevated by



Pulley system, attached to flange at bottom of telescoping hose, moves large bottom of hopper at top of conveyor

conveyor belt to a surge pile. Although the height of the surge pile varies, it is often 40-45 ft. below the discharge chute at the top of the conveyor. To keep dust from the fines at a minimum, a 2-piece telescoping rubber hose, designed similarly to suction dredge hose, was installed. One 25-ft. long section is attached to the bottom of the discharge chute and a 20-ft. section fits around the outside of the first section and is made with a flange at the bottom. Cables attached to the flange and controlled from the hopper, raise or lower the hose as the height of the surge pile varies. The telescoping feature permits depositing of the fines directly on the surge pile with little chance for strong winds to blow the fines over the surrounding area. The hose, which was designed by Thermoid Co., is reinforced with wire to prevent collapse and reduce sway.

Hardening Drill Taps

By Paul C. Ziemke

THE SMALL SHOP is somewhat handicapped by lack of special metallurgical departments and special heat treating facilities. However, the average mechanic can turn out professional type work with only the following equipment: a forge, several pieces of channel iron in 6-, 5- and 4-in. and some 12-in. sizes, a quantity of good

coke, a tub of water and one of quenching oil. The latter should be equipped with a wire basket to facilitate treating several pieces at one time.

To prevent blistering, the recommended practice is to place a piece of channel iron in the fire and bank around it with dampened fuel, first covering the channel with an iron plate. In the hollow thus formed, place the taps and bring the whole to a red heat by adjusting the blower to furnish a medium draft. When a red heat is achieved, make a hole in the fuel bed under the channel and shut off the air. This hole forms a superheated retort into which a tap can be submerged to produce the desired yellow heat, after which it is withdrawn and doused in oil.

To prevent scaling, good success is had by using an admixture of the following ingredients: 20 percent borax; 50 percent corn meal; 20 percent common salt; and 10 percent powdered resin. During preheating, as the tap attains a dull red, it is immersed for a minute and then replaced on the fire.

This treatment forms a coating that protects the threads, allows the work to quench quickly, and is readily washed off. The same treatment may be successfully applied to cutters and reamers.

Stacker Belt Supports

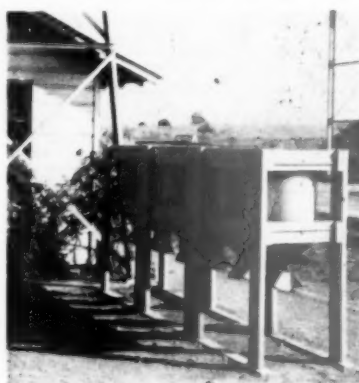
A SYSTEM OF STACKER BELTS over a single reclaiming tunnel can be a costly and elaborate installation. However, one mid-western operator supported the outboard end of five or more stacker belts by resting them on a 12- x 12-in. timber truss of laminated construction which parallels the reclaiming tunnel under the storage piles. The plant is of modest capacity with all shipments going out by truck.



Single truss supports outboard end of all stacker belts

Small Silos for Storing Samples

AT A LARGE OPERATION on the Pacific Coast, car samples of sand are taken after the car is loaded. Gravel and crushed products are often sampled on the belts by first stopping them,



Samples of sand and gravel are stored in row of small silos at field-testing laboratory for obtaining check samples for customers

and then taking a cut about 6 in. wide across the wide loading belt. The small building shown in the illustration is alongside the loading belt and is the field-testing laboratory. The neat small silos shown have quadrant gates and are used for storing rejects from previously tested cars. If a customer wants a sample for check purposes, it is easily available.

Gravel Separation

KEEPING CRUSHED GRAVEL separate from uncrushed need not require an elaborate installation. The accompanying illustration shows a simple installation. The belt conveyor at right is No. 1 serving the scalper screen. Over-size goes to a cone crusher (not

HINTS AND HELPS



Crushed gravel discharging to truck bin

shown) that discharges to the belt at left, serving the small bin. Over the bin is a small 2-deck washing screen. Oversize is returned to belt No. 1. Dust is spouted to a 60-in. sand preparation machine at left (also not shown) through an inclined pipe. Crushed and washed gravel discharge into the round-bottom truck bin. Since all gravel at this plant is small in size, only one reduction crusher is required.

Conical Scrubber Screen

AT A WESTERN OPERATION, gravel and crushed gravel are given a preliminary scrubbing and screening after which they are dry screened and binned. A reclaiming belt, which is divided into three main sections, operates under the bins. The illustration at the left shows the main belt from the bins at the left. This belt can load sand or other materials direct to trucks, or the aggregates can go to the conical scrubber rinse screen, from which the material may be loaded to the trucks or to the truck-loading bins. The illustration at the right

shows the essentials of the conical rinse scrubber. The inner cone is the scrubber barrel; the outer is $\frac{1}{4}$ -in. mesh screen. Gravel is fed direct to the inner scrubber barrel. Fines are wasted.

Transmission Belts

A NEW RUBBER TRANSMISSION BELT, made of rayon fabric instead of the conventional cotton fabric, has been

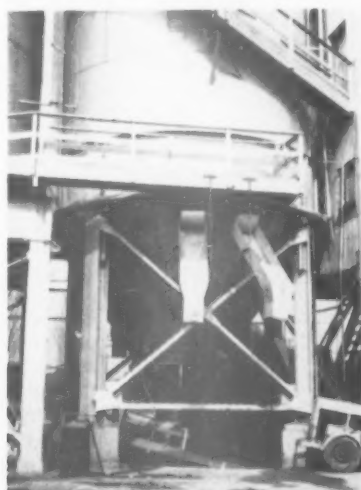


Rayon fabric transmission belt installed on a 4-ft. cone crusher

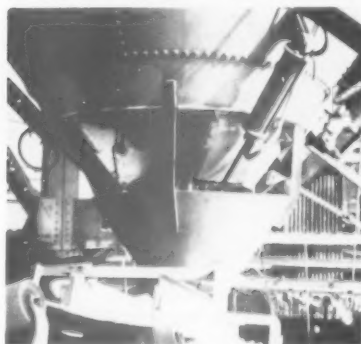
developed for use on medium duty drives for fans, blowers, air compressors, pumps, machine tools, crushers, mills and for many special types of machinery. The new belts, developed by The B. F. Goodrich Co., are said to be 25 percent stronger and have 50 percent less stretch than conventional fabric belts made with the same number of plies.

Aggregate Bins

A READY-MIXED CONCRETE PRODUCER who is also an important aggregate shipper has the bins at one of his plants so arranged that aggregates for truck shipments can be drawn from a conical-bottom storage bin.



Aggregate can be conveyed to truck loading bin or loaded to trucks direct from storage



Conical bottom storage bin is equipped with air gates

The gates are equipped with air rams for remote control. Electric bin vibrators assure an even flow of material from the bins. Aggregates from these bins are usually conveyed to a series of truck loading bins by use of a belt conveyor and a shuttle over the truck bins; however, trucks can be loaded directly from the storage bins by the chutes shown.



Left: Main belt from bins at left can load direct to trucks or to conical rinse scrubber. Right: Inner cone is scrubber barrel; outer cone is $\frac{1}{4}$ -in. mesh screen



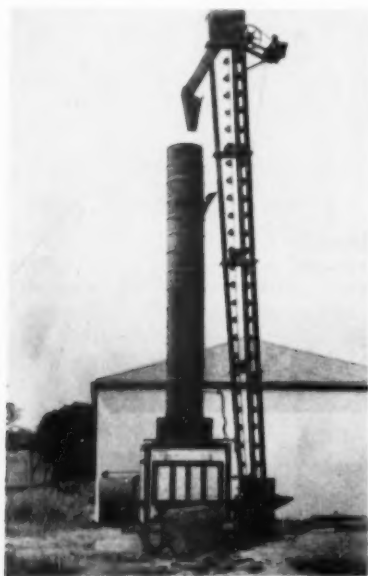
NEW

Machinery



Calcination Kiln

FLEX-I-KAL FURNACE Co., P.O. Box No. 2, Columbus 16, Ohio, has developed a self-contained, mobile model



Self-contained mobile calcination kiln

CA calcination kiln suitable for many of the heat treating operations which formerly necessitated a large rotary kiln installation. The kiln is particularly adaptable to the production of bloated or expanded lightweight clay aggregates. The output of this unit may be continuous or batch as desired. The volume or tonnage output, it is reported, compares favorably with rotary kilns. Design permits quick and economical teardown and reassembly if the unit is to be employed as a mobile kiln, according to the manufacturer.

Conveyor Belt Fasteners

FLEXIBLE STEEL LACING Co., 4607 Lexington St., Chicago 44, Ill., has announced a new design of drive-on



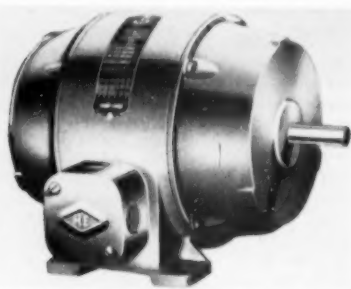
Drive-on belt conveyor fastener

conveyor belt fastener for repairing and joining conveyor belts. The teeth are formed slightly outward making prepunched holes to guide the teeth

unnecessary. The "Turtle" conveyor belt fastener, as it is called, is made in one size only at present. One plate length of three teeth on each side, two long and one short, permits the minimum number of plates to be used with maximum strength of joint. The Turtle is available in steel, monel, stainless and everdur. The Turtle is made for repairing rips in conveyor belts $\frac{3}{8}$ to $\frac{1}{2}$ in. thick and for joining medium duty conveyor belts $\frac{3}{8}$ to $\frac{1}{2}$ in. thick.

Multi-Speed Motor

REULAND ELECTRIC Co., Alhambra, Calif., has announced that a single unit of its new multi-speed motors can be operated at different speeds. These motors are available in either 2-, 3- or 4-speed ratings and provide various torque-horsepower-speed com-



Multi-speed motor available in four speed ratings

binations: constant torque for conveyors and air compressors, variable torque for fans, blowers, centrifugal pumps, etc., and constant horsepower for shapers, grinders, etc. Two-speed motors are supplied with either one or two windings—3- and 4-speed motors with two windings only. Motor sizes range from $\frac{1}{2}$ to 150 hp. The motors can be furnished in either standard, totally enclosed, splash-proof or explosion-proof designs. They are also available as Motoreducers and with magnetic brakes.

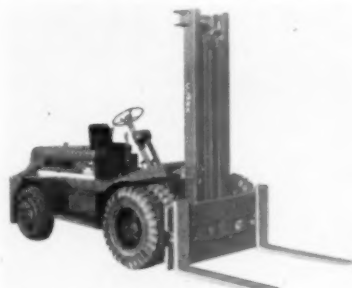
Heating Screen Cloth

HEWITT-ROBINS INC., 666 Glenbrook Road, Stamford, Conn., has developed a new method of heating screen cloth by electricity to prevent clogging or "blinding" when wet materials are screened. Electrical current is carried to the screen by short insulated cables attached to copper bars which are located under the screen cloth and make direct contact with it. The current distribution bars are shielded from abrasive action of material being screened. Current going into the screen cloth is regulated by a Han-non variable-step, screen cloth heater.

Voltages range between 5 and 15 volts and amperes from 1000 to 4000.

Fork Truck

CLARK EQUIPMENT Co., Industrial Truck Division, Battle Creek, Mich., has added the Yardlift-100 to its line



Fork lift truck designed for outdoor use

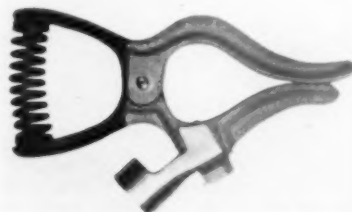
of fork lift trucks. This gas powered, pneumatic-tired truck has a 10,000 lb. capacity at 24 in. load center and is designed for heavy-duty high tiering under difficult outdoor conditions. The truck is powered by a Continental engine producing 55 brake hp. at 2000 r.p.m. and a traveling speed of 17.8 m.p.h. It has a 133 in. turning radius. Hydraulic steering is standard. The standard over-all height is 113 in. with fork lowered and 178 in. maximum with forks raised to 144 in.

Gearmotor

WESTINGHOUSE ELECTRIC CORP., 401 Liberty Ave., Box 2278, Pittsburgh 30, Penn., has developed a Lifeline single-reduction gearmotor (Type B). The gearmotor meets side entry agitator and mixer mounting requirements and is suitable for light duty coupled-service applications such as fans and pumps. It is available in ratings from 1 to 30 hp., 780 to 420 r.p.m., A.G.M.A. Classes I and II.

Welding Ground Clamp

TWECO PRODUCTS Co., Box 666, Wichita, Kan., has added the Model GC "Cub" ground clamp to its line of arc welding ground clamps. The new clamp has a rated capacity of 200



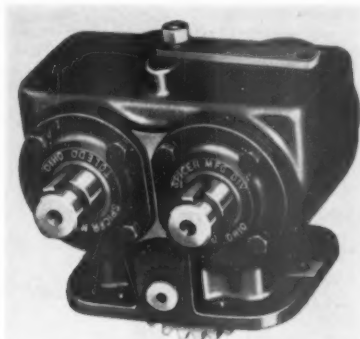
Ground clamp with 200 amp. rated capacity

NEW MACHINERY

amp. The clamp features a protruding upper lip for extra leverage in applying, wide jaws for added conductivity, serrated lower jaw which removes rust and scale as the clamp is applied, an insulated spring and a simple bolt and clamp connection.

Power Take-Off

SPICER MANUFACTURING DIVISION, Dana Corp., Toledo, Ohio, has announced the Brown-Lipe power take-off having dual output capacity with two drive shafts that permit operat-



Power take-off with dual output capacity

ing separate units at different intervals. For example, it can handle simultaneously such jobs as operating gasoline and fuel oil pumps, winches and posthole diggers, pumps and lift gates, etc. All shafts and gears are mounted on tapered roller bearings. Continuous or intermittent operation is possible. Both shafts may be assembled to the front or rear, or one to the front and the other to the rear. By changing input gear only, the unit may be adapted to other transmissions. It is supplied for cable or lever control. The model K is for use with spur gear applications, and its companion model KN for helical gear use.

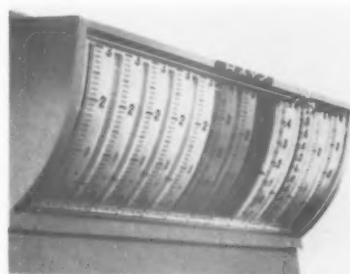
Bituminous Mixing Plant

IOWA MANUFACTURING Co., Cedar Rapids, Iowa, has announced a newly engineered and improved volumetric-type bituminous mixing plant designed to supply specification mix in large volume. This continuous-mix plant consists of two units—the Model MM Master Mixing unit and the Model MGC Master Gradation Control unit—combined into a complete plant to meet bituminous pavement specifications with high capacities of graded and uniform bituminous mixtures. The unit is offered with a 36-in. x 12-ft. single shaft pugmill or a twin-shaft type which is rated up to approximately 200 t.p.h. The manufacturer claims the following features for the plant: accurate controls, adjustable displacement positive type pump, a covered 48-in. calibrated apron feeder. A remote control weatherproof station panel is also available which contains electric clutch control, "auto-

manual" selector switch and various indicating lights. The gradation control unit of the fully enclosed Master plant can be replaced, if desired, by Model TEF transfer elevator and feeder unit for production of single aggregate hot mixes. A bulkhead type aggregate feeder is available for the Model MM mixing unit to produce single aggregate cold mix. Either Cedarapids 72-in. x 24-ft. or 88-in. x 28-ft. dryers are designed to operate with the plant. The complete plant is portable.

Draft Gauge

THE HAYS CORP., Michigan City, Ind., has developed a draft gauge with the following features: 3-way atmospheric vent; "one man" zero check; large identification label space; magnetic access door; fluorescent lighting for easy reading; removable units; no parallel; dust-tight case, and lucite scales. Called the Verti-scale, its basic operating mechanism consists of a diaphragm, enclosed in a cast metal housing, the force and movement of which is balanced against the force of calibrating springs. The resultant force and movement of the diaphragm is transmitted through linkage to the pointer to indicate the magnitude of the draft, pressure or differential to which the diaphragm element is subjected. The gauge is available in four types of mounting to meet special requirements of individual installations: a semi-flush mounting; a recessed mounting for above eye-level reading; an eye-level mounting and a projected or lug mounting. The gauges can be obtained with a spring loaded metallic bellows for indicating functions such as level,



Draft gauge consisting of diaphragm enclosed in a cast metal housing

flow, temperature, and pressure pneumatically transmitted by other instruments. Ranges from .2 in. of water to 120 in. of water, draft, and differential can be provided.

Truck Line

GENERAL MOTORS Co., Chevrolet Motor Division, General Motors Building, Detroit 2, Mich., has announced that the 1953 truck line has been increased to a total of 74 models on 11 wheelbases and features greater horsepower and chassis ruggedness. Ranging in size from the sedan delivery on a 115-in. wheelbase to a school bus chassis of 212-in. wheelbase, accommodating bodies of 54 passenger capacity, the models are offered with two engine types, the Loadmaster and the Thriftmaster. The Loadmaster engine, with a compression ratio of 7.1:1 and horsepower of 108, has been redesigned. A 45-ampere generator is standard equipment on both engines. On the cab-over-engine series, the radiator core is fitted with a shroud which directs the air circulated by the fan through the radiator core.



Volumetric-type bituminous mixing plant



SMELTER SLAG PROCESSED FOR BALLAST

Primary crusher preceded by scalper screen, left, and cone crusher with double-deck vibrating screen, to the right

UTAH SAND & GRAVEL PRODUCTS CORP., Salt Lake City, Utah, is the leading aggregate and ready-mixed concrete producer in the area. Its Beck Street plant is the older operation but this includes a relatively new ready-mixed concrete plant which was described in the February, 1949, issue of *ROCK PRODUCTS*, page 159. These plants serve the industrial northern section of the city. About two years ago a sand and gravel plant and a ready-mixed concrete plant were established at Butlerville, about 11 miles southeast of Salt Lake City. These plants serve a rapidly growing section.

The newest venture of the company is a modern, all-steel slag processing plant located at Garfield, Utah, 22 miles west of the city on the Western Pacific railroad. The Garfield plant was built primarily as a ballast operation supplying the W.P. railroad. Eventually, however, it is expected that the other railroads which converge at this point will be similarly served. Plans are now underway to reprocess the fines from the new plant

Utah Sand and Gravel Co. producing ballast material from copper smelter slag at Garfield, Utah, and sand and gravel and ready mixed concrete at Butlerville

By **WALTER B. LENHART**

as the material is a hard, sharp and very abrasive product highly suitable for sand blasting, traction sand, truck sand and other similar uses. Also, it is thought that both the ballast and fines waste will be in demand as concrete aggregates and for highway construction.

Salt Lake City and the surrounding area has long been the center of the copper smelting industry of Utah. One of these copper smelters is the Garfield plant of American Smelting and Refining Co. Slag from the Garfield smelter has been accumulating for many decades on a high slag dump. Many millions of tons of old material are available as well as slag from current production. The slag is a jet black, harsh and sharp, glassy obsidian-like material and weighs 2941 lb. per cu. yd.

The smelter is built on the side of a relatively high mountain. An industrial rail haulage system transports molten slag in large-capacity dollies on a relatively even grade to the dumping point. Carrying out this practice for 50 or more years at Garfield has built up a large relatively flat-topped dump that is about 75 ft. high. The dump forms a large circle about 2000 ft. in diameter. Its face is practically vertical and the dumping procedure is to keep the railroad tracks which are located entirely around the periphery of this dump close to the rim and to let the molten slag cascade down the face. The tracks are continually moved outward as the pile is extended. This procedure over the years has built up a series of relatively thin layers of black slag that range from flat angles to almost vertical. Therefore, with a raw material of this character it is not difficult

to loosen it with a Caterpillar No. 28 ripper and then to push the loosened material to the belt loading hopper serving the plant. The ripper is provided with a dozer blade but most of the slag is moved with a second Caterpillar tractor; both are RD-8's. New slag from the furnaces is dumped on the opposite side of the area where the slag processing plant is located and is not at this time utilized for ballast production.

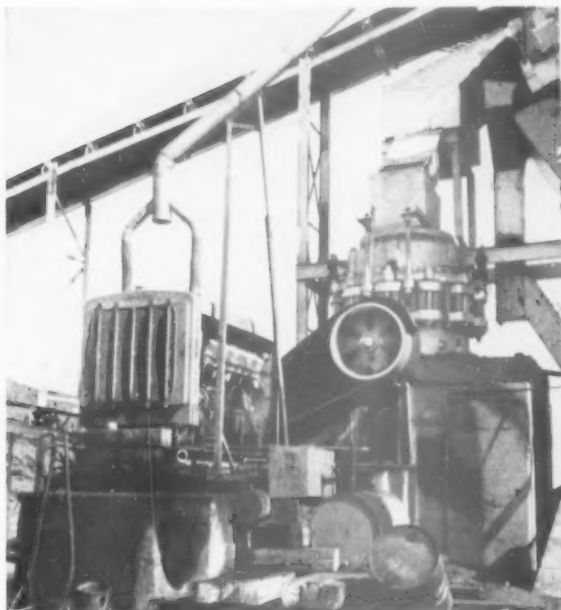
According to some concrete technologists those natural rocks that are glassy (e.g., lavas, obsidians) are harmful to concrete for they are reactive. Under this theory the alkali in the portland cement reacts with the chemically active silica in the rocks to form a gel. The expansion of the gel destroys the concrete. One corrective is to add finely ground reactive material with the idea that the harmful reaction will take place before the concrete sets. Slags that are cooled quickly are more chemically active than those that cool slowly, so the Garfield slags (which have cooled in thin layers at a relatively fast rate conceivably could act as a corrective for reactivity when ground extremely fine (minus 200 mesh).

The slag in this dump, unlike that processed at the steel mills, does not contain any metal from the furnace operations but it appears to have been the burying ground of a certain amount of iron and steel from the shops and debris disposal from the smelter. To protect the crushers used in the slag processing plant a metal detecting device for the feed conveyor was first tried. This equipment was made locally and was designed to stop the belt conveyor when a piece of magnetic material passed under the



Foreign material is removed from slag ahead of primary crusher

AGGREGATES



Left: Primary jaw crusher with scalper screen above. Right: Short head cone crusher installation

magnet. It only reacted to magnetic objects. However, it was too sensitive, for when the steel belt lacing passed under the unit, the belt stopped. A non-magnetic type of belt lacing is now being tried. Pending a solution of this problem the larger pieces of iron and steel are hand-picked from the 30-in. conveyor belt serving the field hopper.

The dump seems to have an attraction for lightning, for since the slag plant started operation in May, 1952, the transformers located on the rim of the slag dump have been put out of commission twice. When the first set of transformers was lost, the company was able to get another set locally so that the plant was down only a few days. However, soon thereafter a second bolt of lightning hit the transformers and new replacements had to come from the east. To correct this situation, high lightning rods have been installed at the four corners of the substation. The transformers now rest on a steel base and ev-

erything is grounded. Some of the ground wires lead over the rim of the dump to a nearby flowing ditch. Others finger out over the slag dump in three shallow trenches which have been partially filled with calcium chloride. The idea here is that the calcium chloride, being hygroscopic, will absorb some moisture from the dry desert air, making it a conductor that will help dissipate any electrical surge. Suitable air breaker switches have also been installed which can be pulled at night or on holidays to reduce the danger area.

The plant is located on the rim of the dump so that full advantage is taken of the elevations. The conveyor feeding the plant is carried under the circular railroad tracks in a cylindrical corrugated metal tunnel. The reclaiming operation is carried out entirely within the center of the dump which prevents interference with the smelter dumping operations. The plant is an all-steel structure, very substantial in design and laid out in

practically a straight line. Besides having a high degree of utility, it is good looking as well.

The belt conveyors range from 20 to 30 in. wide and, as the processed slag is relatively brittle, rock ladders are used to minimize breakage from direct falls. Three rock ladders are in use, the longest one being a by-pass to send slag as processed direct to the loading bins. It is about 50 ft. high and is enclosed. The other two are in the plant and are much shorter.

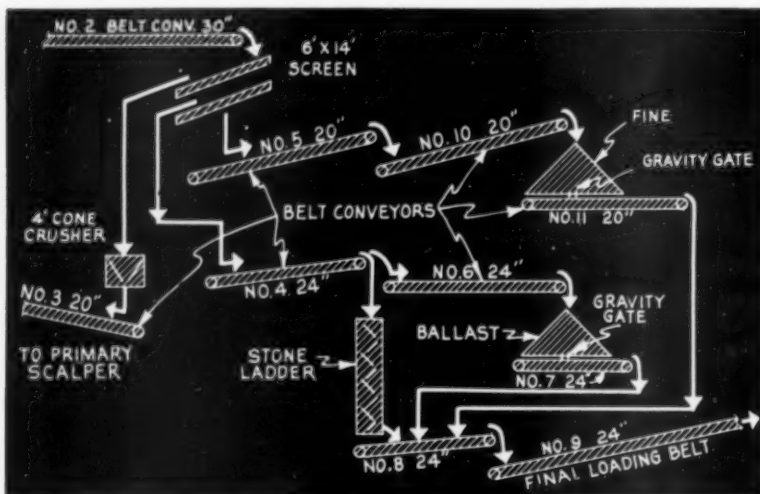
The primary and secondary crushers are both driven by Caterpillar diesel engines. The primary jaw crusher is powered by a D-13000 unit and the secondary cone crusher by a D-17000. These use about 30 gal. of diesel oil per 8 hr. All other units in the plant are driven by electric power. Air for the diesels is piped to the engines from high stacks mounted well above any source of dust.

At present the plant produces but one size of ballast and the reject

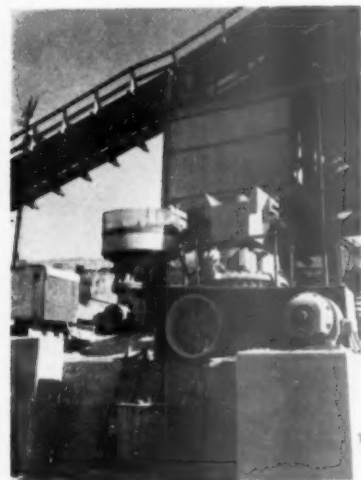
Left: Secondary crusher and final screening plant with two stacker belt conveyors to the right. Note stone ladder, left center, to reclaiming conveyor. Right: Two carloading silos, each of which are 12 ft. dia. and hold 40 cu. yd.



AGGREGATES



Flowsheet of slag processing plant to final loading operation



Small gyratory and cone crusher for secondary reduction



Primary jaw crusher fed by reciprocating pan feeder



Sand and gravel excavated by 5-cu. yd. scraper supplies most of the material for the plant

finer so the flow is therefore relatively simple. The Caterpillar tractor with bulldozer that operates from the top of the dump pushes the slag to a hopper under which is a 30-in. reciprocating feeder. The feed conveyor, housed partially in a short tunnel under the smelter rail, delivers the material to a 4- x 9-ft. Stephens-Adamson two-deck scalper screen with 4-in. openings. The oversize falls to a 15- x 28-in. Alloy Steel jaw crusher. Material passing through the scalper falls to the 30-in. offbearing belt, where it is joined by the crushed slag from the primary. Belt conveyor No. 2 delivers to a 6- x 14-ft. Ty-Rock double-deck (dry) vibrating screen. The top deck has 1½-in. wire for three-quarters of its length with the remainder 1¼-in. wire. The lower deck is ½ in. The oversize from the top deck falls to a 4-ft. short head Symons crusher. The product is returned to the scalper by a 20-in. belt conveyor. The intermediate size (ballast) falls to belt conveyor No. 4 (24 in.) and then to belt No. 6 which is a stacker belt. The minus ½-in. material is similarly stacked by belts Nos. 5 and 10. However, current ballast production can be sent to the

loading bins via the longest stone ladder, thus by-passing the crushed slag stockpile.

Reclaiming ground stored material is accomplished by two belt conveyors, each operating in a tunnel under the piles. Both tunnels are relatively short, and the flat-running belts in them deliver to an inclined conveyor serving the two steel car-loading silos. Thermoid, U.S. Rubber and Goodrich belts are used. The two steel car-loading silos hold 40 cu. yd. each and are 12 ft. in dia. The plant has a nominal capacity of 250 t.p.h. During the 1952 season nearly all the material shipped has been used by the Western Pacific railroad as ballast and the fines for fill and yard work.

The various belt conveyors in the plant have the following widths and uses:

No. 1	30 in.	Feed to primary crusher
No. 2	30 in.	To secondary crusher
No. 3	20 in.	Cone crusher returns
No. 5	20 in.	½-in. stacker system



View of Butleville sand and gravel plant

No. 10	20 in.	1/2-in. stacker system
No. 11	20 in.	Reclaim from fines waste or 1/2-in. material
Nos. 4-6-7-8-9	24 in. (each)	Ballast stacker system and reclaiming and loading of ballast

Butlerville Sand & Gravel Plant

Practically all the gravel produced in the Salt Lake area comes from remnant beach deposits of the prehistoric Lake Bonneville. As the waters of this ancient lake receded these beach deposits were left on the rims of the mountains that now flank Great Salt Lake. The deposits contain excellent gravel and sand that is remarkably free from silt inclusions so that washing and processing is not a serious factor. The bank deposit at Butlerville is typical. The operation is now about two years old and is a 100 percent trucking plant as no railroads serve the plant.

The plant has a capacity of 300 t.p.h. and features the use of a 25-x 40-in. Cedarapids jaw crusher with a 4-ft. standard Symons cone crusher, and a 2-ft. 4-in. Traylor gyratory as secondary crusher. A Stephens-Adamson reciprocating feeder serves the primary crusher. The scalper and finish screens are all Pioneer units; Eagle sand screws augmented by a Pioneer drag account for the sand production. There are two screens in the final washing plant.

Most of the pit excavation is done by a 5-cu. yd. Crescent scraper powered with a Lambert drum hoist that first saw service over 30 years ago on the construction of bridges in the New York area and then on the Bay Bridge between Oakland and San Francisco in California. A 3/4-cu. yd. Bay City shovel is available for other pit operations.

Adjacent to the aggregates plant is a ready-mixed concrete plant, con-



Screw and rake for the recovery of sand

sisting of a Noble batching unit. Aggregates as produced can be binned to small track loading bins or ground stored over the reclaiming tunnel. A Northwest clamshell is also available for reclaiming from stockpiles.

The plant was designed by Stephens-Adamson engineers and uses that company's conveyors for all intraplant transportation.

The deposit does not normally require stripping; however, some parts of the upper zone are higher in fines than is the bulk of the deposit, so when minus 1-in. to minus 1 1/2-in. roadstone is being processed some of that material is blended into the bulk to provide the necessary fines and for highway purposes.

All portland cement used is trucked to the plant in bulk and stored in two cylindrical steel silos.

The Garfield slag plant and the Butlerville sand and gravel operations are under the supervision of Rex Baird, assistant general superintendent of the company. Ezra C. Knowlton is executive vice-president and the operating head of Utah Sand & Gravel Products Corp.

California Mineral Resources

APPEARING in the July, 1952, issue of *California Journal of Mines and Geology*, published by the California State Department of Natural Resources, Division of Mines, is an article by Fenelon F. Davis and Denton W. Carlson, describing the mines and mineral resources of Merced County, Calif. The article states that total mineral production in Merced County, from 1880 to 1949, amounted to over \$32,000,000. The principal items produced were sand, gravel, gypsite, gold, silver and crude platinum metals. Tables list the sand and gravel deposits, showing their location, type, size, rock type, equipment, method of mining and processing and other pertinent data. Flowsheets of three sand and gravel processing plants are also shown. The report is accompanied by a geologic map.

Gypsum Production

DOMESTIC MINE PRODUCTION of crude gypsum during the third quarter of 1952 totaled 2,163,875 short tons, a decrease of 5 percent from the corresponding period of 1951, as reported by the Bureau of Mines.

Imports of crude gypsum were down 7 percent and production of calcined gypsum also showed a 7 percent decrease from the third quarter of 1951, while the tonnage of uncalcined fillers and miscellaneous products increased 80 percent. Production of agricultural gypsum showed a 26 percent increase. Industrial plasters, except those for dental and orthopedic purposes, showed marked declines. Sanded plasters, including perlite-gypsum premixes, showed a 55 percent increase. Other increases included wallboard and laminated board, 5 percent, and sheathing, 22 percent.

Production figures for the third quarter of 1952, according to classifications, were listed as follows:

	Short tons	
	1952	1951
Crude gypsum:		
Mined	2,163,875	2,270,710
Imported	1,218,073	1,311,427
Calcined gypsum produced	1,845,551	1,977,444
Gypsum products sold or used:		
Uncalcined uses:		
Portland-cement retarder	466,333	484,561
Agricultural gypsum	120,369	95,198
Fillers and unclassified	15,901	8,825
Industrial uses:		
Plate-glass and terra-cotta pasters	10,980	15,466
Pottery plasters	10,506	11,787
Dental and orthopedic plasters	2,654	2,287
Other industrial uses	34,298	39,672
Building uses:		
Plasters:		
Base coat	533,226	590,559
Sanded	51,583	33,326
To mixing plants	3,176	4,310
Gauging and molding	46,437	53,486
Prepared finishes	3,679	4,964
Other building plasters	60,408	73,143
Keene's cement	13,337	13,711
*Lath	645,548	704,333
*Wallboard, including laminated board	867,775	827,903
*Sheathing	34,399	28,219
*Tile and miscellaneous	6,265	9,386

*M sq. ft.



Ready-mixed concrete batching plant

DIVERSIFY

Only company which produces cement, aggregates, ready mix, and concrete products

NEW YORK COAL SALES Co., Columbus, Ohio, is one of the most unique organizations in the rock products and concrete products industries, due to its wide diversification of products. It is the only company in these industries which produces portland cement, crushed stone, agricultural limestone, sand and gravel, concrete products, ready-mixed concrete and bituminous concrete. In addition, it produces and sells coal, manufactures clay brick and tile, and handles a varied assortment of building supplies to say nothing of owning and operating large orchards.

The name, "New York Coal Sales Co.," would imply that the company might be owned in the east and that its principal product is coal. On the contrary, it is a 100 percent Ohio concern and a considerable volume of its business is in the rock products and concrete products industries which serve southern Ohio.

The accompanying location map spots the various operations and gives an idea of the marketing range in serving the construction industry.

Portland cement and certain crushed stone products are shipped to more distant points as are clay products and coal, with which we are not so concerned herein.

All of the operations which we will discuss later in this article have grown and expanded to a considerable degree in recent years. The growth in markets and in the production of the more localized operations, including ready-mixed concrete, concrete products and aggregates, is noteworthy since the area is not highly industrialized. The largest city is Chillicothe with some 25,000 people. However, the area, generally, is considered good agricultural country and farm markets have been intensively developed with the result that about 50 percent of total sales of concrete products and ready-mixed concrete are for rural building. The farmers in this southern Ohio area have been thoroughly sold on the merits of concrete.

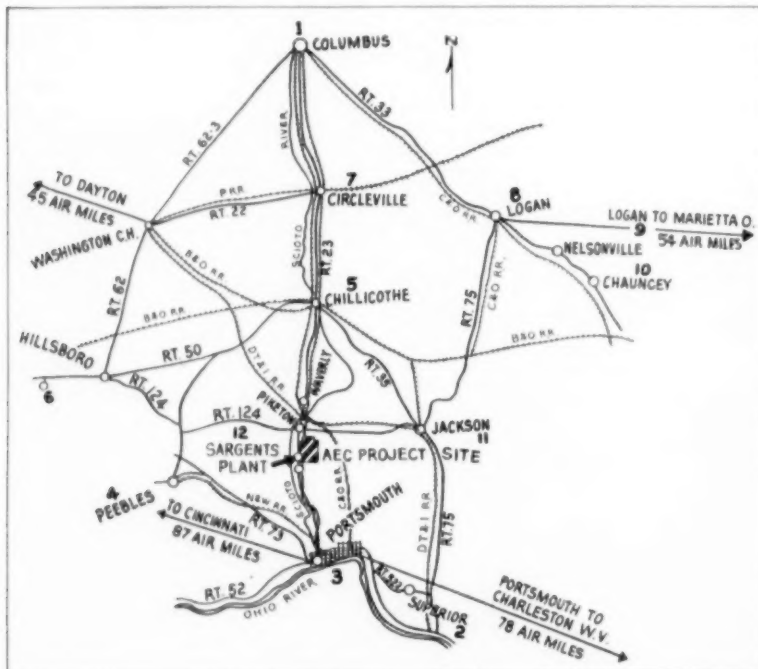
There are many small buyers of concrete products, ready-mixed concrete and agricultural limestone which requires that individual service be

New York Coal Sales Co., Columbus, Ohio, with seven autonomous divisions, produces portland cement, crushed stone, agricultural limestone, sand and gravel, concrete products and ready-mixed concrete

By BROR NORDBERG

given in order to build volume. This service is provided by qualified company salesmen and often through qualified dealers.

However, a marked change affecting these operations has come about in recent months since work started on the new gaseous diffusion plant of the Atomic Energy Commission which is being built some 27 miles south of Chillicothe and 20 miles north of Portsmouth. This project will cost \$1,200 million and has hit Pike county with terrific impact. The very way of life of people for miles around the site is undergoing change. Already there is a heavy influx of workers, motels and other facilities are under construction, and planning is going forward that will result in much new construction. Highways must be widened, bridges be strengthened, new roads built, and homes, stores, schools, water supply and sanitation facilities must be built. In anticipation of



Map showing location of New York Coal Sales Co. division plants and offices.

- (1) New York Coal Sales Co. general offices
- (2) Superior Cement Division plant. (28 air miles to AEC plant)
- (3) Superior Cement Division offices
- (4) Plum Run Stone Division plant. Producer of crushed stone and railroad ballast
- (5) Basic Construction Materials Division. Producer of ready mixed concrete, sand and gravel, concrete block and all types of building material
- (5) Central Repair Shop
- (5) Southern Quarries and Contracting Division. All types of bituminous paving
- (6) Highland Stone Division
- (7) Basic Construction Materials Division. Ready-mixed concrete plant. All types of building materials
- (8) Hocking Valley Brick Co. Plant. (48 air miles to AEC site)
- (9) Hocking Valley Brick Co. Plant. (51 air miles to AEC site)
- (10) New York Coal Co. Producer of bituminous coal. (54 air miles to AEC site)
- (11) Southern Orchards Division
- (12) Sargents plant of Basic Construction Materials Division. Ready mixed concrete and asphaltic concrete plants

DIVERSIFICATION



Left to right: E. H. Davis, chairman of the board; G. K. Mitchell, president; and R. M. Patton, executive vice-president

heavy demands for its products, the company is completing a new operation at Sargents, directly opposite the AEC plant across U.S. highway 23, where ready-mixed concrete and hot asphaltic mixes will be produced. None of its other plants in these industries is more than about 40 miles distant from the project.

The company's history dates back to 1902 and, accordingly, its Golden Anniversary was celebrated in 1952. A beautiful brochure was printed commemorating the company's 50th year in business, which reviews past progress, covers present operations and plans for the future. The booklet was published for distribution to customers and employees.

In recognition of the occasion and because of the great diversification of the company in the rock products and concrete products industries, we have devoted these pages of **ROCK PRODUCTS** to company practices and a discussion of plant operations in these industries with emphasis on developments of recent years. Our discus-

sions of plant operations are not detailed or lengthy but are intended to point up the nature and scope of production facilities and to acquaint our readers with a rapidly growing organization which might otherwise be considered only as a New York organization that sells coal.

Elias M. Poston, founder and first president of the then New York Coal Co. organized in 1902, originated many of the businesses in which the company is still engaged. Since that time, the company has spanned 50 continuous years, covering a transformation from the steam age into the atomic age.

The original company bought property in Athens, Hocking and Perry counties and started development of their natural resources. In the course of its history, some 23 coal mines have been exhausted. In the early 1920's all stock and other ownership interest not held by the New York Coal Co. was drawn into two securities holding companies but, as operations and activities continued to expand, it became

advisable to consolidate the many interests.

This was done in 1938 when the New York Coal Sales Co. was formed, as a marketing organization for coal produced by the New York Coal Co. and also other coals produced in Ohio, West Virginia, Kentucky and Pennsylvania. This move involved the liquidation of some corporations but continued in existence the New York Coal Co., Hocking Valley Brick Co., Hocking Coal and Land Co., Cincinnati Mining Co., Dover Coal and Land Co. and Southern Ohio Quarries Co. Control of the latter four companies was acquired in 1940 and their separate status was abolished.

At the present time, the parent Sales company has seven separate operating divisions, as follows:

1. The Coal Sales Division with headquarters in Columbus. This Division markets coal from five producing districts.

2. The Superior Cement Division of Portsmouth which has a mill at Superior, Ohio.



Left to right: H. H. Moore, vice-president in charge of cement operations; Geo. Quillin, secretary-treasurer; and C. P. Shaw, assistant vice-president in charge of sales and public relations

DIVERSIFICATION

3. The Plum Run Stone Division of Peebles which operates a crushed stone plant at Peebles, Ohio, where agricultural limestone is also produced.

4. The Basic Construction Materials Division of Chillicothe with a sand and gravel plant, concrete block and ready-mixed concrete plants at Chillicothe; a ready-mixed concrete plant at Circleville; and building supplies at both locations. The new Basic Construction Materials branch at Sargents in Pike county where ready-mixed concrete and bituminous concrete are to be produced.

5. The Highland Stone Division of Hillsboro with a modern crushed stone plant near Hillsboro. Agricultural limestone is also produced here.

6. The Southern Orchards Division of Jackson with modern apple processing and storage facilities in Jackson county.

7. The Central Repair Shop Division of Chillicothe where heavy equipment is serviced.

In addition to these divisions there are two affiliate companies, the New York Coal Co. and the Hocking Valley Brick Co. The New York Coal Co. opened two new mines in 1952 at Glen Ebon, Ohio, and a preparation plant was started that will have a daily capacity of 3000 tons of crushed coal. The Hocking Valley Brick Co. plant at Nelsonville has been modernized and enlarged at a cost of \$500,000. Annual production is in excess of 45 million brick. Brick and tile are shipped as far as Denver, Colo., into Florida and into Canada.

Organization

The various divisions are set up to be operated under division managers and supervisory heads who have more or less local autonomy. They are fused into a main organization so that each division has the benefit of cooperative effort from the others in solving operating problems and in the conduct of engineering, research, financial problems and marketing. This is accomplished mainly through weekly and other periodic meetings

held at the Columbus headquarters where the operating problems of each division are fully and frankly considered. It amounts to a system of cooperative management. Managers of the various divisions are given the responsibility and are provided the necessary incentives to make their divisions profitable. Each Division must stand on its own as far as profits are concerned.

Each division manager has the responsibility to plan ahead for his division and submits a completely planned program at years end for the coming year. In these reports he itemizes anticipated expenditures for capital investment and other expense, inventories, makes recommendations for advertising and promotional outlay, estimates production and sales and all other items of cost and expense.

Divisional managers are encouraged to be, and are, active in civic organizations and the company has memberships in all pertinent national associations like the National Sand and Gravel Association, National Ready Mixed Concrete Association, Portland Cement Association, National Agricultural Limestone Institute, National Concrete Masonry Association, and other groups.

Many forms of advertising are carried according to local conditions and the markets involved. Among the types used are book matches, local newspapers, direct mail, school athletic program, etc., and promotional pieces created by the company. Among the latter, an excellent and informative 32-page booklet entitled, "Limestone and Your Business" was put out and copyrighted in 1950 by the Plum Run Stone Division. Material in this booklet was compiled as a result of collaboration with government agricultural agencies, leading schools of agronomy, the National Agricultural Limestone Institute and other authoritative sources, with the result it contains much useful and educational information of the kind needed to promote the use of agricultural limestone. Among the topics covered were a dis-

cussion of limestone and dolomites, methods of application, the need for liming, methods of testing soils and sampling, the optimum times for application and the role of calcium in crop growth. Charts showing the recommended pH for various crops and photographs to illustrate results from liming were incorporated as was information on the company's production and delivery facilities.

The company has an insured compulsory retirement plan at age 65 and has a training program that provides personnel three-deep for key positions.

As an incentive to efficient plant operation, a "President's Cup" is awarded annually to the plant superintendent who is voted to have the best-operated plant. Judges are the superintendents of the various plants who are taken on a tour of all operations for the purpose of inspection and voting. Each man casts a vote for his first, second and third choices, the rating being made on the basis of the following points:

- 1) Good Housekeeping
- 2) Maintenance of equipment
- 3) Utility of manpower
- 4) Quality of product
- 5) Handling, yarding and loading of material
- 6) Efficiency of layout
- 7) General plant condition

The award is a new event and is shown later in this article as presented to the first winner, Earl E. Fender, superintendent of the Highland crushed stone plant near Hillsboro, Ohio

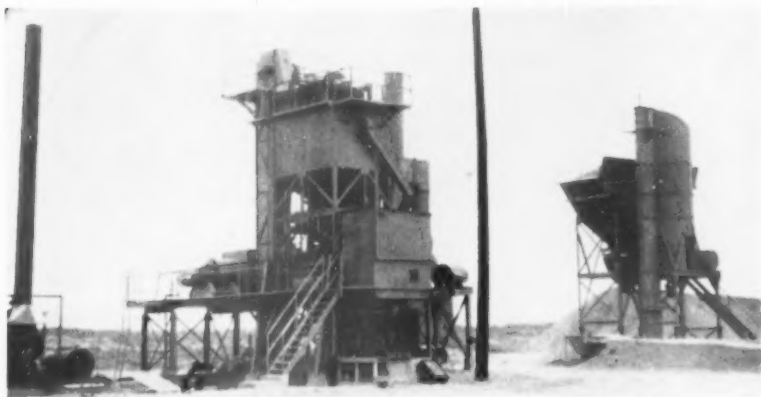
Executives

Chief executive officer of the company is Edwin H. Davis, past president, who was elected chairman of the board of directors of all three companies in 1952. Mr. Davis has been associated with the company for 45 years in many capacities, having served as legal counsel prior to becoming president.

He is either an officer or director of many associations and organizations serving the coal and clay products industries, the Columbus and



Left to right: Wm. A. Rodgers, division manager of the Basic Construction Materials Division; Leo Davis, division manager of both Highland Stone Division and Plum Run Stone Division; Wm. B. Carder, sales manager of Superior Cement Division; and Paul Ryan, superintendent of maintenance of all divisions



Asphalt plant, left, and ready-mixed concrete plant at Highland stone plant

Ohio Chambers of Commerce, is a National Councilor on the U.S. Chamber of Commerce for the Portland Cement Association, a past director of the P.C.A., a member of the A.I.M.E., president of the Ohio State Safety Council and director of several other companies.

Gilbert K. Mitchell, president, has been with the company 32 years, serving as traffic manager, assistant vice-president, vice-president and executive vice-president before election to the presidency. He, too, is active in a long list of associations and clubs, and presently is vice-president of the American Coal Sales Association. He is a director of all three companies in this group.

Robert M. Patton, executive vice-president, has been with the company 11 years with four years out for military service. Mr. Patton had been a cement salesman, assistant general manager of the Contracting Division, assistant executive vice-president of the New York Coal Sales Co., vice-president in charge of operations of all three companies and now is a director of all three companies. Mr. Patton was the first president of the National Agricultural Limestone Institute, having been elected at its first annual convention in January, 1952.

George W. Quillin, secretary and treasurer, has been with the company 29 years, serving previously as assistant auditor, auditor and assistant secretary and treasurer. He is now a director in all three companies. Mr. Quillin is also actively engaged in association work.

H. M. Moore, vice-president in charge of cement operations, has a background of 28 years with the company, serving as accountant and purchasing agent, assistant treasurer, secretary and treasurer and vice-president to 1949, all with the Superior Cement Division. He was elected vice-president of New York Coal Sales Co. in 1949 and became a director in 1950.

Clarence P. Shaw, assistant executive vice-president in charge of sales

and public relations, has been associated with the Superior Cement Division for 20 years. Starting out as packing department foreman, he became assistant traffic manager, traffic manager and then sales manager before coming to the home office. He has spent 26 years in the cement industry.

William B. Carder is sales manager of the Superior Cement Division with headquarters at Portsmouth. Operating personnel for this Division are listed later in our discussion of the cement mill, as are the superintendents of the other plants in the rock products and concrete products industries.

Leo L. Davis is division manager of both the Highland Stone Division and the Plum Run Stone Division with crushed stone plants at Hillsboro and Peebles, Ohio. Ellis D. Davis is assistant sales manager of the Highland Stone Division.

William A. Rodgers is division manager of the Basic Construction Materials Division with headquarters at Chillicothe, and James Callihan is sales manager. This Division has responsibility for the concrete block plant, sand and gravel plant and ready-mixed concrete plant at Chillicothe, the ready-mixed concrete plant at Circleville, and building supplies at both locations. The division was formed

in 1948 when the Transit Mixed Concrete Corp. was also absorbed.

Central Repair Shop Division has a shop at Chillicothe for maintenance work on all heavy equipment. Equipment is being standardized throughout the various divisions as an aid to an orderly program of repair and preventive maintenance. The company has some 200 pieces of mobile and construction equipment which are serviced here. Paul E. Ryan is superintendent of maintenance of all three companies and all divisions.

In the following pages, the various plants are briefly discussed, with main emphasis on developments of comparatively recent date and on operating features of most interest.

HIGHLAND STONE DIVISION

Commercial crushed stone, railroad ballast and agricultural limestone are produced in a modern plant near Hillsboro, Ohio, which started operations in April, 1952. The Highland Stone Division was established in 1950 when the plant, equipment and property of the Scott Limestone Quarries at Danville was acquired. The quality and quantity of the stone soon proved inadequate at that location and the present property was acquired and a new plant built.

The present plant was designed by company personnel, using some of the equipment from the Danville operation and much new equipment. It is a unique layout and truly a straight-line flow operation. Overall length is 424½ ft. and maximum width is 24 ft. which is the finished stone products bin. Capacity is 130—150 t.p.h. and output is rated at 350,000 tons annually.

The quarry is in a high calcium limestone deposit characterized by thin laminations. Stone is considered tough and of high quality. Drilling is done with two well drills and the stone is loaded by a 2-cu. yd. Lorain shovel into Koehring Dumpsters for delivery to the plant. Average load is nine tons. The primary crusher is at one end of the plant and the finished stone bins over 400 ft. away at the far end, there being no deviation from a straight line.

The plant may be considered as comprising three parts. First, the crushing is done in one long, narrow building as shown in the accompanying illustration. Then follows a screening plant where the agstone is screened out, and then a second screening plant where commercial stone sizes are screened into bins. Intra-plant transportation is by belt conveyor.

Dumpsters discharge on to a 36-in. x 8-ft. Cedarapids feeder which regulates the flow into a 2036 Cedarapids primary jaw crusher. Product of this crusher is carried by a 30-in. belt conveyor, 350 f.p.m., which discharges into a 4X Gruendler center-feed hammermill, driven by a 200-hp.



Superintendent Earl E. Fender, holding president's trophy, awarded for excellence in plant management



New crushed stone plant of Highland Stone Division is a straight-line plant. Quarry-run stone is dumped at extreme right, agricultural limestone is screened out in first screen house, and commercial stone is sized in second screen house. Asphalt and ready-mixed concrete plants, to the left

direct-connected motor which has a variable speed starter. This mill is reversible and may be run clockwise or counter-clockwise to equalize the wear on the hammers, liners and grate bars. Replaceable Cedarapids hammer tips have been installed in mill in the interest of standardization.

Size of product is regulated to a considerable degree through use of the variable speed starter on the secondary hammermill. A coarser product is attainable when running the mill at slow speed, a finer product at higher speed, and a still finer product results when the mill is run counter to the flow direction of the stone.

Stone discharged from the Gruendler mill is delivered over a 30-in.

belt conveyor to a Cedarapids unitized secondary unit which has a 4- x 12-ft. double-deck vibrating screen where the top size is controlled. The secondary unit has a 3033 Cedar Rapids hammermill and the conventional wheel arrangement to elevate the stone on to the conveyor belt within the secondary unit itself.

Stone discharged from the secondary unit is carried by a 24-in. inclined belt conveyor (350 f.p.m.) into a screen house where the load is split over two 4- x 12-ft. Cedarapids double-deck vibrating screens. Agricultural limestone is dropped into bins, and all plus No. 8 mesh stone is diverted into a chute for passage through an Allis-Chalmers rotary

scrubber or it may by-pass the scrubber and be conveyed on to the finished sizing screens.

When scrubbed, the stone is put over a 4- x 12-ft. Cedarapids double-deck rinsing screen and then discharges to a 24-in. belt conveyor. The alternate flow is for the stone to discharge on to a by-pass conveyor beneath the washer which transfers to the 24-in. belt conveyor. This conveyor, on 134-ft. centers, delivers (350 f.p.m.) to the screens over finished stone products bins.

Three basic sizes are here produced over a 4- x 12-ft. Cedarapids double-deck vibrating screen, and a fourth is produced by blending the rejects over the top deck, off the bottom deck and the troughs of the bottom deck. Finished sizes are dropped into a 320-ton bin which has four compartments and two discharge gates for each.



Ready-mixed concrete unit, foreground, and hot mix asphalt unit, background, at Highland plant



View of crusher building showing load of stone being delivered in background

One of the control features, to minimize the production and stockpiling of undesired sizes, is a return system at the first screening building whereby any undesired size may be returned through a 10-in. manganese steel pipe to an 18-in. conveyor belt which discharges into the 3033 hammermill for the production of finer material. Thus, production may be balanced according to demands for sizes.

As a regular practice, hammermills are not set up tight in order to produce agricultural limestone, but during the rush season a very high tonnage can be so produced. Ordinarily, crushers are set a little on the open side in order to obtain high production overall.

A ready-mixed concrete plant and an asphalt plant are also operated at the Highland crushed stone plant. The ready-mixed concrete plant consists of an Erie batching bin served by a 1-cu. yd. Osgood clamshell and a Johnson bulk cement bin. Capacity is 700 cu. yd. of concrete per day.

Asphaltic concrete is produced by a Hetherington-Berner PA-30 asphalt plant with a twin Buell dust collector. Capacity is 120 t.p.h. of hot-mixed asphalt products.

Five different sizes of material are required in producing these two products and they are stockpiled on the ground with bulkheads between to prevent inter-mixing the sizes. The same clamshell serves both plants.

Sand must be shipped to this location for both ready-mixed concrete and asphalt mixes. Later this year, the production of manufactured sand is contemplated.

Earl E. Fender is superintendent of the Highland plant.

SUPERIOR CEMENT DIVISION

The Superior cement mill is located some 20 miles east of Portsmouth. It is one of the earliest cement plants to have been built in the state of Ohio. Production was started in 1907, when the original Superior Portland Cement Co. was organized. Until then the location had been known as Center Furnace. Later, the plant was owned and operated by the Wellston Iron Furnace Co. Superior Cement Corp. was formed in the early 1930's with the change in ownership, and in 1949 this wholly-owned subsidiary was made a division of New York Coal Sales Co.

This is a dry process plant, with short rotary kilns, located at a site originally chosen for its high-grade limestone and shale and because coal was readily available. Originally, coal for firing the kilns and for power development was mined right at the site simultaneously with the development of an underground limestone mine. The plant was steam-powered until 1925 when it was converted over for electric power. Coal was mined for firing the kilns until 1941 when the seam became exhausted.



Stone is loaded into haulage units holding nine tons

This plant had undergone very little change until the last several years, when a progressive program of modernization and enlargement was launched which has brought capacity up from about 800,000 bbl. annually to exceed one million barrels. Basic operating methods have been unchanged with the exception of the new finish mill department which we discuss herein.

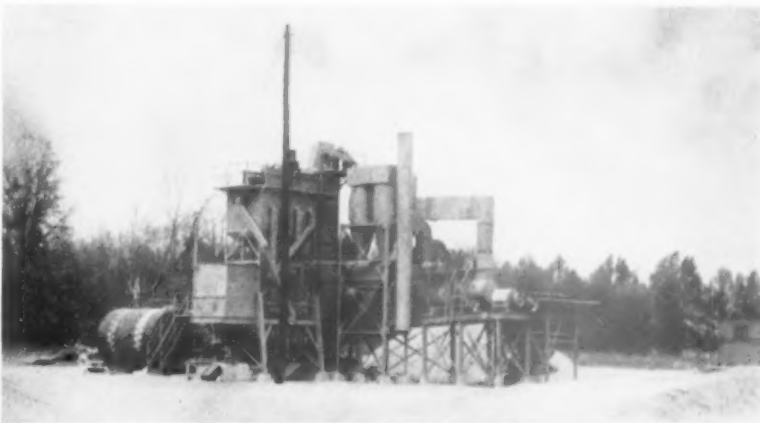
The four original 7- x 7 1/2- x 125-ft. rotary kilns have had their 7 1/2-ft. diameter burning zones enlarged to 8-ft. diameter, and a fifth kiln meas-

uring 9 x 8 x 125 ft. has been installed to increase clinker capacity.

Fuel economy is not as critical at this plant as in most, since all the coal is produced by truck-haul strip mines. The kilns have no heat recuperators, coolers or waste heat boilers and therefore have little instrumentation. Four of them are supplied fuel from a centralized grinding mill with bin system, the fifth kiln being direct fired from a unit mill. A second Raymond coal pulverizer was recently installed to increase coal-grinding capacity. Clinker is cooled in storage, us-



Finished stone bins foreground with agstone bins beyond, showing rotary scrubber



Closeup of hot mix asphalt plant at Highland stone plant

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ing a slackline bucket for re-handling in stockpile to facilitate cooling and handling for delivery to the finish mill department.

Most of the other mill changes are conventional in that they constitute necessary adjustments to balance production to the enlarged clinker and finish grinding capacities. New storage bins for limestone, shale and sand were built in 1952, to provide larger reserves for the raw mill. Seven limestone silos hold 7000-8000 tons, two shale bins provide storage for 1600 tons, and sand storage is 1000 tons in two bins. These figures represent active storage—not total storage.

Raw grinding capacity has been enlarged by approximately 20 percent by the addition of a Bradley Hercules mill and a tube mill taken from the dismantled finish mill department. Blending capacity has been proportionately increased and made flexible

for more effective blending efficiency. The original six blending bins have been increased in height from 20 to 40 ft., and two additional 40-ft. high bins have been provided for corrected mix. Blending is accomplished through bucket elevators and screw conveyors.

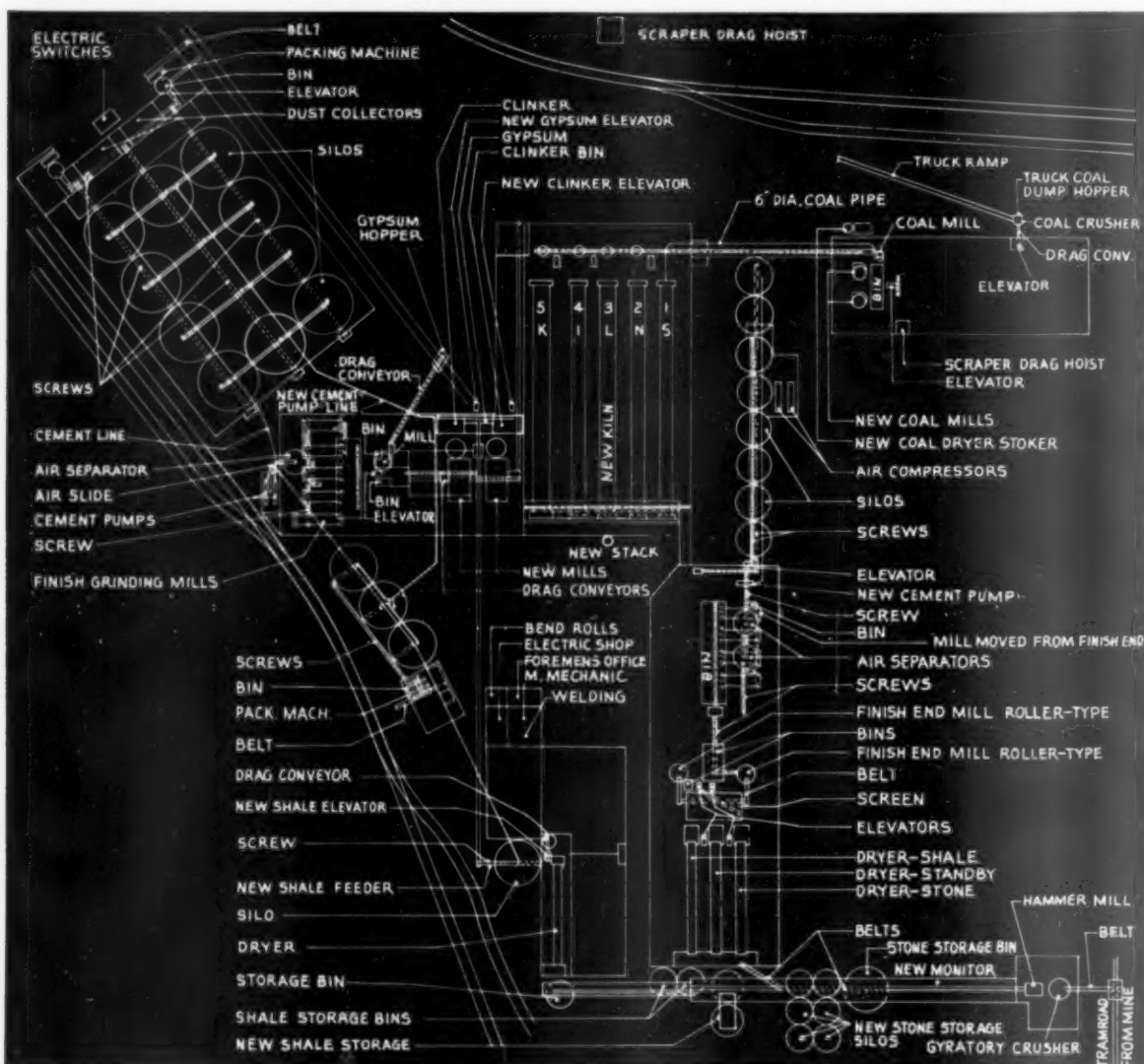
Other postwar developments have included a completely new packhouse, which now has two 4-spout St. Regis packing machines with a separate packer for Wifco mortar cement, which is a large volume product. Its name, incidentally, is derived from the initials taken from the old company name, "Willston Iron Furnace Co." Other products manufactured are standard portland cement and air-entraining portland cement. Finished cement storage capacity is 148,000 bbl., in modern concrete silos.

Among other improvements have been new covered facilities for loading cement into trucks, and a 10- x

45-ft. Fairbanks-Morse truck scale. Whereas none of the output was moved by truck two years ago, 50 percent of total production is now so shipped, mainly reflecting increased demands for the production of ready-mixed concrete and concrete products.

Finish Mill

Largest single unit in the modernization and enlargement program is a completely new finish grinding mill department completed in 1952, which is among the finest in the cement industry. It differs from more or less standardized practice throughout the industry in that clinker is ground in single-stage circuit, with large capacity ballmills in closed-circuit with mechanical air separators. This system of grinding requires carrying large circulating loads, which are in terms of 300 to 500 percent.



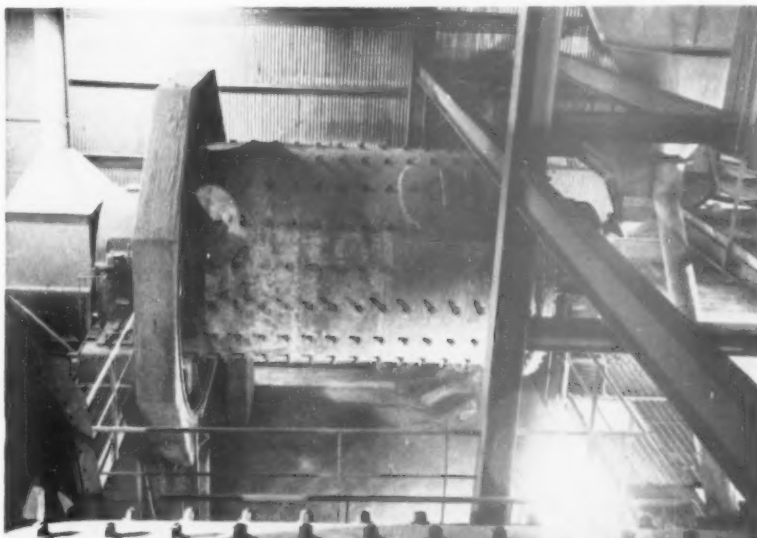
Layout of Superior mill, indicating the many improvements made progressively during recent years. Since this revised drawing (April, 1951) a new finish mill to left of kilns has been completed for single circuit grinding of clinker



Showing how rejects from air separator are returned into mill with fresh feed

The installation has only been in operation for a few months so data on circulating loads and performance are necessarily lacking at this time; therefore we are limited herein to a description of the equipment and methods.

There are two parallel grinding circuits, each consisting of a $9\frac{1}{2}$ - x 15-ft. Allis-Chalmers prelinimator in circuit with a 16-ft. Sturtevant mechanical air separator. Each circuit is designed to produce 75 bbl. of cement per hour with a circulating stream of possibly 300 bbl. per hour. The installation includes overhead storage bins for clinker and gypsum, Merrick

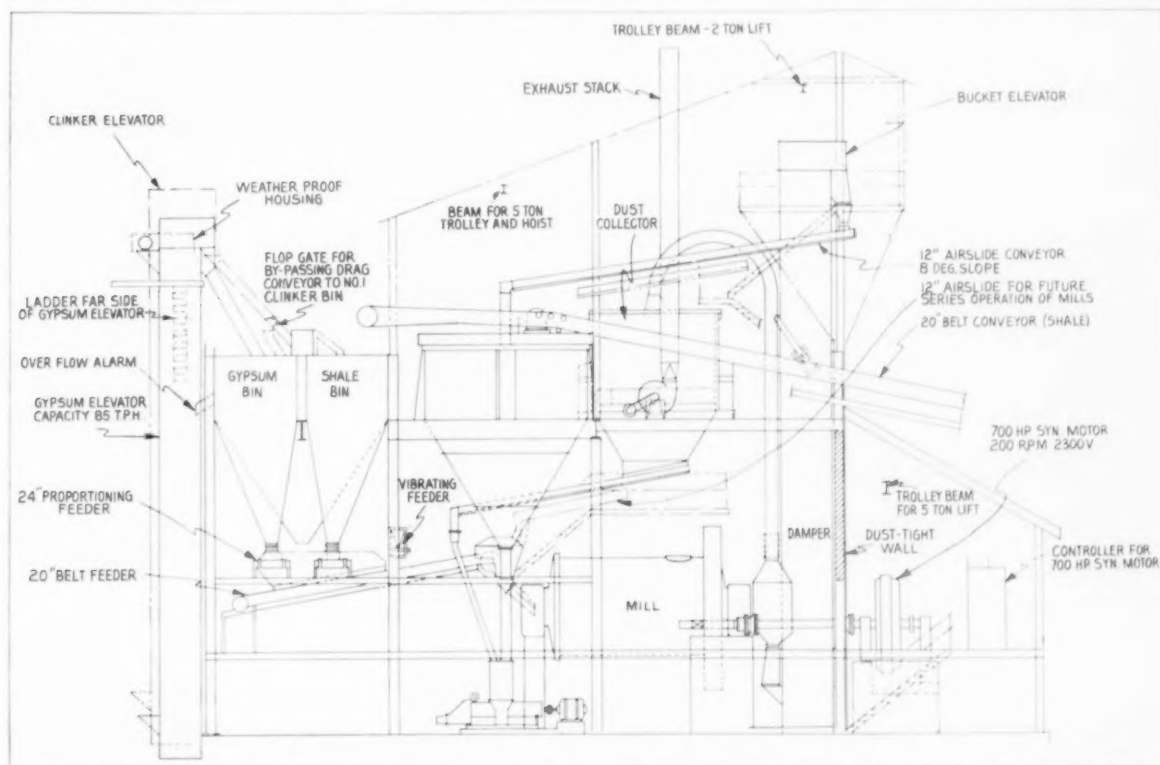


One of two $9\frac{1}{2}$ x 15-ft. mills, each of which grinds clinker in closed circuit with a mechanical air separator. Pipe on left is to overhead dust collector

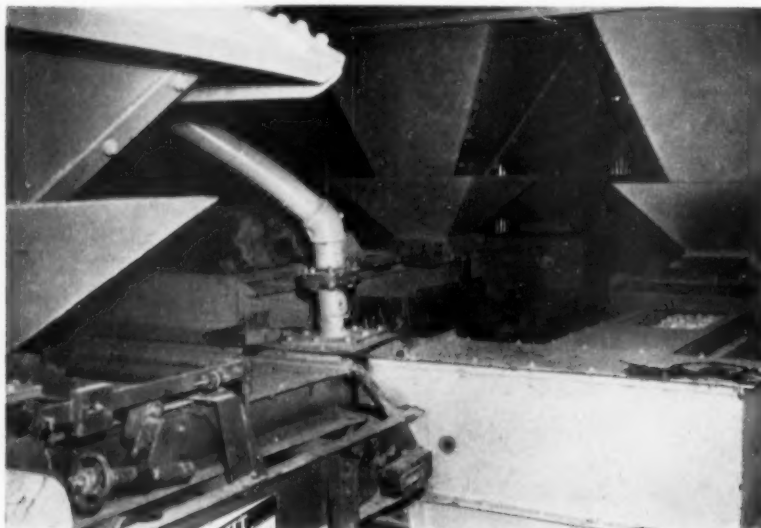
Feedweights for regulation of proportions on to belt conveyors which feed the mills, individual dust collectors, bucket elevators, and F-H airslides to handle the mill product into the air separators and the cement dust from the collectors.

Feed bins comprise two steel bins for clinker, each holding 130 tons, and a gypsum bin of 70 tons capacity.

Gypsum is elevated into the bin by enclosed bucket elevator. Clinker is elevated to the top of clinker bin No. 1 where there is a flop gate to divert the stream into that bin, or to a drag conveyor which fills into clinker bin No. 2. Clinker is handled at the rate of 90 t.p.h. and the gypsum elevator is rated at 85 t.p.h. An overflow indicator or alarm is to be provided at



Elevation drawing of clinker grinding department which consists of duplicate grinding mills, each in closed circuit with a mechanical air separator



Each grinding circuit has separate proportioning feeders for clinker, gypsum and shale, delivering to a common 20-in. belt conveyor which feeds the mill

clinker bin No. 2, and the gypsum bin.

Each grinding circuit has three 24-in. Merrick Feedweights—one for each material—delivering proportioned materials direct from the bins on to a 20-in. inclined belt conveyor feeding the mill. Air-entraining agent is added by Syntron feeder, as required, on to this belt from an overhead small hopper.

The grinding mills are driven at 19.2 r.p.m. by 700-hp. Electric Machinery Mfg. Co. synchronous motors through Fast's self-aligning couplings. Drive motors are rated at 200 r.p.m., 2300 volt, 60 cycle and, with their controllers, are mounted in an adjoining room to keep out dust. Each mill carries a graduated ball charge, totalling 46 tons, of 3½-, 3-, 2½-, 2-,

and 1-in. grinding balls. Replacement grinding balls likely will be of the largest size. The mills have water-cooled bearings.

Mill product in each case is elevated and fed into the mechanical air separator by a 12-in. F-H airslide sloped at 8 deg. The layout has provided for an added 12-in. airslide in the event it might later prove desirable to operate the mills in series, in which case the product from one mill might be fed into the air separator in the second circuit.

Mechanical air separators were designed for extra heavy duty and have special wear-resisting liners because of the high circulating loads carried. Their elevation is limited so that the reject spouts are just over the point



F. E. Besco, plant superintendent of Superior Cement Division

of feed into the mill, requiring just a short spout into the box for return of rejects.

Each grinding circuit has a No. 44 type EE 360 Sly bag-type dust collector, drawing dust from the discharge



Electric vibrating feeder regulates rate of feed of admix from hopper on to belt conveyor feeding mill

box of the mill, the elevator and Feedweights. A 6-in. F-H airslide conveys the dust from the collector to a spout delivering to the hopper of the 8-in. F-K cement pump.

A new storage dam and reservoir



Eugene H. Depriest, chief chemist of Superior Cement Division



Cement plant at Superior is one of the oldest plants in Ohio. It was built in 1907. Capacity has been increased in recent years

impounding approximately 10,000,000 gal. of water was added in 1952.

Operating personnel comprise: F. E. Besco, plant superintendent; E. H. Depriest, chief chemist; Earl S. Keevil, engineer; and John E. Vetter, traffic manager.

SAND AND GRAVEL

Basic Construction Materials Division has its main operations centered at Chillicothe where sand and gravel, ready-mixed concrete and concrete products are produced. This Division also controls the ready-mixed concrete operations at Circleville, and the new plant at Sargents in Pike County adjacent to the atomic energy project is a branch. Warehouses at both Chillicothe and Circleville for a complete line of building materials sold in conjunction with ready-mixed concrete and concrete products also come under this division of the company.

The sand and gravel plant at Chillicothe was built in 1941 and began operations in June of that year when a new deposit was opened and a completely new plant was built. It was operated under the name of Southern Ohio Quarries Co. until 1948 when the Basic Construction Materials Division was formed to encompass sand and gravel along with concrete block and ready-mixed concrete production, which were added that year.

The sand and gravel plant as originally built had a high degree of flexibility to meet difficult specifications as we pointed out in our description of the plant as published in *Rock Products*, August, 1941, pp. 32-34.

A brief summary of what has already been published in *Rock Products* will suffice herein to point up the main features of the plant since they are basically unchanged. The main changes have been to step up production and improve general operations. They involve some equipment replacements for greater production, changes in sand production to increase the recovery of fines and for better control of moisture as an aid to greater control over ready-mixed concrete production. Other changes are only in details. Production has been stepped up from about 85 t.p.h. to 140 t.p.h.

The plant is centered around the Kern radial storage system and was designed by Fred T. Kern Co. This system has the sizing screens supported over a central cylindrical tower from which separating walls radiate out into the storage area. Storage is provided for seven sizes of gravel. This principle of ground storage has the advantages of providing virtually unlimited storage, and flexibility in blending to meet size specifications. Live storage capacity, reclaimed for loading out, is about 75 tons in each of the compartments, and a Marion clamshell may be operated in the circle around the storage area moving the gravel into dead storage or returning it into live storage.



Scalping-crushing unit of plant. Incoming belt conveyor is to the left. Also on the left is belt conveyor to screening plant. Background is loading-out bin. On lower right is sand stockpiling belt conveyor

A 6-ft. sq. reinforced concrete conveyor tunnel extends under the control tower and is the means of drawing off any sizes, or blends, by belt conveyor for loading. Gates to the reclaiming tunnel belt conveyor are opened by means of controls at the top of the tower. These controls are calibrated to accurately control the gate openings in blending gravel from storage for shipment.

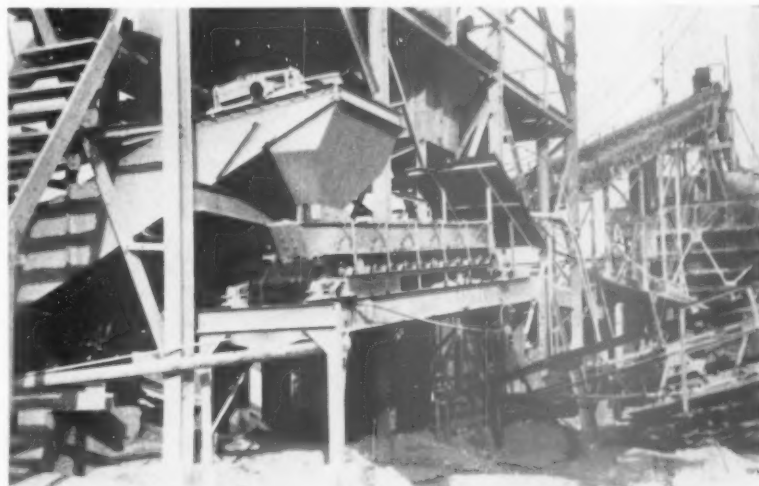
In addition to this central screening and storage unit, the plant layout comprises a primary scalping and crushing section, stockpiles, and loading out bins. Belt conveyors are used for all transportation between production units.

The deposit is practically free from clay and other deleterious materials, with sand representing some 50-60 percent of the total. There is very little gravel over 3- or 3½-in. size. Excavation is done with a 1½-cu. yd. diesel-powered dragline. Haul to the plant is by narrow-gauge rail, an 8-ton Plymouth locomotive hauling four 5-cu. yd. Western side-dump cars to

each train. The cars dump into a hopper from which a Jeffrey vibrating feeder regulates the flow to a 30-in. primary belt conveyor delivering to the head of the scalping-crushing part of the plant. Here, the stream of material is put over a 4- x 10-ft. Allis-Chalmers low-head scalping screen, where oversize is taken off for crushing, fines are screened out for processing into sand, and intermediate sizes are sent on to the main sizing screens over the radial storage system.

Oversize gravel, usually plus 2 in., drops into a surge box over the crusher which is directly below. Other intermediate sizes of gravel also can be put through the crusher. A belt conveyor under the crusher and scalping screen carries the material to the sizing screen superimposed on the radial storage cylindrical tower. This material ordinarily consists of uncrushed gravel in the desired range of size and crushed gravel.

Since the plant was built, the original crusher has been replaced by a



Closeup of dewatering belt conveyor which delivers masons sand from sand drag to stockpiling belt conveyor

DIVERSIFICATION



Another view of scalping-crushing unit. Belt conveyor in foreground carries incoming material

2020 New Holland double-impeller crusher for increased capacity and to reduce maintenance.

Sand preparation equipment is located below the scalping screen and consists of a sand tank with dewatering drag. Production of concrete sand is rather unusual and consists of blending a masons sand as produced, with a $\frac{1}{8}$ - to $\frac{1}{4}$ -in. product stockpiled separately in the gravel storage system. In blending, stockpiled sand which has been drained is reclaimed by belt conveyor, as is the coarser fraction, the two combining on a belt conveyor filling the loading-out bins.

This system of producing sand has not been changed since the plant was built, except for details. The sand drag length has been greatly increased and the settling area enlarged because too much of the fines were being lost. Two stockpiles of sand are now built up rather than one, to be drawn from alternately after a 12 hr. drain period as a means to hold uniform, low moisture content for better control of ready-mixed concrete operations. This was adopted in 1948, when the production of ready-mixed concrete was started at Chillicothe.

One of the unique features of the plant is a Kern dewatering belt conveyor which is probably the first, and possibly only, one installed in a commercial sand and gravel plant. Its



Locomotive and cars deliver pit run material to a hopper at plant

purpose is to take masons sand direct from the sand drag and deliver it in dewatered condition to the stockpiling conveyor.

This cross belt conveyor, as shown in the accompanying illustration, is inclined at about a 10 percent grade, is 15 ft. in length, with 22-in. belting and travels at about 25 f.p.m. The sand is confined by 12-in. skirtboards to a 12-in. width on the belt, building up a filtering bed for drainage. The water drained off drops over the sides of the belt on to a pan under the conveyor extending for its full length. It drains toward the lower end into the main flume disposing of the overflow water from the sand producing equipment.

Actually, the sand remains on this belt only about 45 seconds before transfer on to the stockpiling belt conveyor, and it is surprising the amount of free water thus removed. The dewatering belt conveyor was a new and untried device when first installed,



Superintendent Robert Carroll

but has been in continuous use for ten years now with favorable results.

Screening of finished sizes of gravel is accomplished over a pair of vibrating screens and the different sizes, usually six, are dropped into ground storage. In addition to railroad ballast and conventional gravel sizes, among the finer gravel sizes produced are a $\frac{1}{8}$ - x $\frac{1}{4}$ -in. (No. 9) product for top asphalt surfacing and for reblending with masons sand to make concrete sand, and a $\frac{1}{8}$ - x $\frac{3}{8}$ -in. product for ice control. In recent years, the bulk of the output has been for the production of ready-mixed concrete and concrete products. Concrete sand and No. 9 state specification gravel are used for concrete block manufacture.

With the radial system of storage, it is easy to return any finished size for re-crushing and to combine various sizes in producing to meet a variety of size specifications including those which specify required percentages of crushed particles.

In loading out gravel, or blends, from stockpiles, the tunnel belt re-

turns the gravel to the central crushing section where it is put over a rinsing screen and then carried by a 30-in. belt conveyor into a 4-compartment 150-ton Heltzel truck-loading bin. Each truckload is weighed by a 20-ton Howe scale which has a 9- x 34-ft. scale platform and is located directly under the truck-loading bin. Rail deliveries are handled by truck to a siding.

Robert Carroll is superintendent of the plant.

READY-MIXED CONCRETE

When the Basic Construction Materials Division was formed in 1948, ready-mixed concrete and concrete products were added to the company's many enterprises. The first ready-mixed concrete plant was established at Chillicothe where a batching plant of 65 cu. yd. per hr. capacity was erected adjacent to the truck loading bins of the sand and gravel plant. Through simple manipulation of flop gate at the head of the belt conveyor filling the gravel-loading bins, the flow is diverted into the batching plant bins. This is a transit mix operation as are the other plants of the company, and, in this case, two stops of the transit mixers are required, bulk cement being batched into the mixers at the nearby concrete block plant where large storages of bulk cement are provided in three bins.

A second ready-mixed concrete plant was soon established at Circleville, Ohio, where the plant is located on a rail siding for delivery of bulk cement. This plant consists of a 400-bbl. bulk cement bin and a 3-compartment aggregate bin holding 240 tons. Sand and gravel are delivered to this plant from the nearby plant of Sturm and Dillard Co.

The company has standardized as much as practicable on equipment. The batching plants at Chillicothe, Circleville, Sargents and Hillsboro are all Erie plants. Truck mixers are Rex. Most of them are 4½-cu. yd. high dumps but a few 3-cu. yd. transit mixers continue in service. The fleet has grown from three mixer trucks in 1948 to 26 units now in



Radial storage system for sized gravel. Sizing screens are overhead. Below is draw-off conveyor

DIVERSIFICATION



T. M. Rinehart who is in charge of all ready-mixed concrete operations

service operating out of all the plants including the one recently completed at Sargents. Chasses are International and the mixer trucks are all painted a standard blue and red, and kept spotlessly clean.

About 50 percent of ready-mixed concrete deliveries are to rural customers, out of all plants, and the balance is sold within the communities where the plants are located. Concrete is sold generally on a strength basis. The business has been built on service and the company takes pride in saying that deliveries are so accurately scheduled that it would almost be possible to set the time according to the deliveries as made. Ready-mixed concrete is delivered within a 35 mile radius of each plant. T. M. Rinehart is in charge of all ready-mixed concrete operations.

A complete line of building products is stocked at warehouses established at both Chillicothe and Circleville in 1950. The line includes clay tile, paints, sash, etc., and block are kept in stock at Circleville.

The new branch of the Basic Construction Division is at Sargents which is located on U.S. highway 23



Concrete block plant has completely paved storage area and is modern throughout

just opposite the location of the Atomic Energy project. This plant was placed under construction in October, 1952, and consists of a high capacity ready-mixed concrete plant and a hot

mix asphalt plant.

A 1000-ft. siding was constructed at the site by the N & W railroad and cars will discharge aggregates into a pit of reinforced concrete and steel



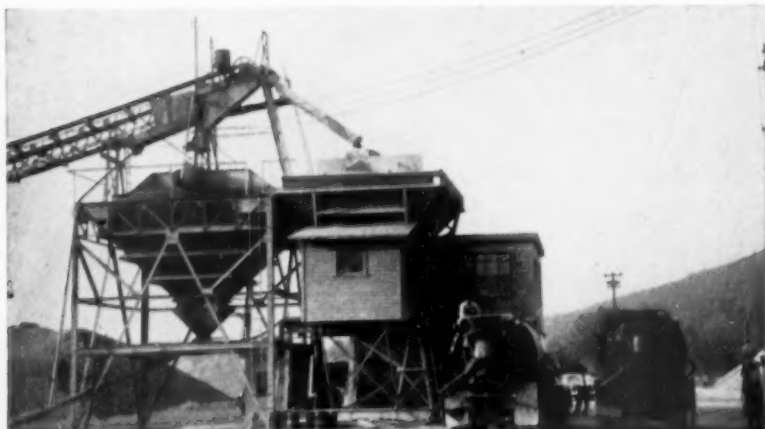
New high capacity concrete batching plant near atomic energy plant. Office and boiler plant buildings to the left



Kenneth Cooper is superintendent of operations at the Circleville plant



Ready-mixed concrete plant at Circleville, Ohio



Batching plant for ready-mixed concrete at Chillicothe. Sand and gravel plant loading-out bins are on left, batching plant for concrete is on right

construction. A short 30-in. belt conveyor will transfer to a 24-in. inclined belt conveyor on 140-ft. centers which, in turn, will discharge on to a 74-ft. shuttle conveyor 36 ft. overhead for stockpiling. The stockpile will be 60 ft. across at the base, 200 ft. in length, and will provide storage for four sizes of aggregates.

Aggregates will be reclaimed through a system of tunnel gates to

a 24-in. belt conveyor, 380-ft. centers, which will discharge into the top of the batching bin via a flop gate system. The head pulley of the conveyor will be 58 ft. above grade.

The batching plant is a 212-cu. yd. Erie plant providing for three sizes of aggregate and having a bulk cement compartment of 425-bbl. capacity. A surge tank provides 800 bbl. additional cement storage. The plant



Ray Carroll, superintendent of block plant

has a 5-cu. yd. aggregate weigh hopper and a 36-cu. ft. cement batcher, weights being controlled by electric eye.

Water is supplied from a well adjacent to the plant and is pumped into a water tank elevated 12 ft. above the batching floor where live steam is injected into the water when operating during cold weather conditions. Water level in the tank is controlled by an automatic float system. Bin signals have been provided for both the aggregate and cement bins. Steam for heating the aggregates and the water is supplied by a 40-hp. Leffel Scotch Marine Type boiler which is oil-fired and fully automatic.

On the opposite end of the stockpile, a Barber-Greene No. 848 asphalt plant of 90-120 t.p.h. capacity is being located. A Northwest clamshell will feed aggregates directly into the feed hopper of the plant.

A 28- x 30-ft. portable steel building incorporating a maintenance shop for truck mixer equipment is being erected at this location. Charles Roy is superintendent at Sargents.

CONCRETE BLOCK

Concrete block are manufactured at Chillicothe. The plant is representative of modern practice throughout and is located within a few hundred feet of the sand and gravel plant

(Continued on page 148)



Plant at Peebles, Ohio is on Norfolk & Western railroad. Pulverizing plant is on left



Quarry is operated on five benches, selectively, due principally to variations in hardness



James E. Callahan, sales manager of the Basic Construction Materials Division

Sink Deep Holes at Low Cost With Rotary Drill

Virginian Limestone Corp. steps up drilling
production and reduces the loading time

By DAVID O. DUNCAN*

INCREASING OUTPUT with decreasing manpower has been one of the most urgent problems faced by all industry during the past ten years. In some areas, however, the problem has become more acute due to the building up of the armed forces and expansion of industry. These industries have been attracted by a fair supply of manpower, adequate water supply, low-priced land, lower wage scales, adequate transportation facilities, lower local and state taxes, and availability of raw materials.

The area in which Virginian Limestone Corp., Ripplemead, Va., operates fulfilled these requirements for other industries. Among the major industry expansions have been the new Celco plant of Celanese Corp. of America, which called for the employment of several thousand persons and increased the need for housing and stores, and the additional powder plant capacity of Hercules Powder Co., at Radford, Va. National Gyp-

Electrically operated rotary drill travels on crawler treads. Power is delivered at 2200 volts and is reduced by transformers to 440 volts for operation of the drill. Additional weight of transformers at the rear of the machine give it better balance



sum Co. and Standard Lime & Stone Co. also added lime kilns to their plants at Kimballton, Va.

As a result of these industrial expansions draining away manpower, Virginian Limestone Corp. found it impossible to operate with 24 men in quarry drilling and blasting. Additional equipment had to be purchased to reduce manpower requirements.

Delay-Action Blasting Reduces Secondary Drilling

The new era started with the purchase of a Loomis Clipper well drill. Since no trained men were available, the operation of the drill was contracted to a firm which specialized in the drilling of water wells. Addition of this well drill helped the labor situation as ten men were able to handle the drilling and shooting in the quarry. When our men, who had been assigned to work along with the contract drillers, had acquired the necessary "know-how" to operate the well drill, it became no longer necessary to contract the drilling.

A new problem now appeared: that ever-welcome demand for more stone. As increasing demands were made, it became necessary to lengthen the hours of the operation of the well drill, until finally the machine was working "around the clock." During this period of wishing that there were more hours in the day, a 27 T Bucyrus-Erie drill was ordered. Thanks to the timely development of millisecond delay-action blasting, and its beneficial effect on secondary drilling, it was not necessary to hire more men. Since the demand was still not satisfied, both the Loomis and the Bucyrus-Erie

drills were being forced into longer and longer hours.

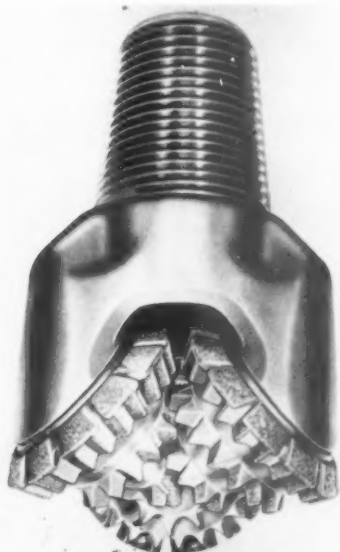
Within the year, we received preliminary information about the first rotary well drill machine, developed by Joy Manufacturing Corp. This company's engineers took samples of the stone but, due to its toughness and its silica content, were not very enthusiastic about placing the drill in operation in our quarry. On the other hand, we were not satisfied with the idea of drilling blast holes, using water to carry out the chips, and then having to try to bail out blast holes over 200 ft. deep and get them ready to load with dynamite.

As time passed, it became apparent that it would be necessary to place the well drill machines on a two-, or even three-shift basis, to keep up with the demand. Searching for a way out of this dilemma resulted in a new investigation into the available methods of drilling and their applicability to our operation.

With the following basic knowledge, we again entered into another phase of searching for improved methods of drilling:

1. Our stone is a tough, seamy dolomite.
2. The Los Angeles rattler loss is approximately 17 percent.
3. Average around 4 percent silica, free and combined.
4. Well drill and jackhammer bits dulled after drilling about 18 ft.
5. It would take about one month to drill the average 210-ft. blast holes with a well drill.
6. Tungsten carbide bits for the

*Plant engineer, Virginian Limestone Corp., Ripplemead, Va.



Rotating head gears of drill



View of quarry face with shovel ready to load blasted rock. Rotary drill is above, to the right

jackhammers lost their inserts after drilling about 130 ft.

7. Compressive strength of stone was around 29,000 p.s.i.

Other new types of drills were eliminated from consideration because blast holes were too deep and it was impractical for us to open upon new levels to overcome this difficulty even if more satisfactory methods of drilling could be found.

Due consideration also was given to the fusion-piercing equipment which was being tested on the taconite iron ore range in Minnesota. However, calculated oxygen costs, plus the anticipated holes of extreme irregularity, ended any ideas in this direction.

High Velocity Air Cleans and Cools Drill

In the meantime, Joy Manufacturing Co. had redesigned its original rotary drilling machine, and had come out with a unit which was called the "Heavy Weight Champion." In this new machine, the water-cooling and the water-chip removal system had been replaced with a high-velocity air-system (3000 f.p.m. velocity). The machine was purchased on a minimum footage and bit-cost guarantee.

Soon after the new drill was placed in operation, it became apparent that it was exceeding our highest expectations. Though the machine has never quite operated at the guaranteed bit-cost, it was clear that we could not reject the machine, just because of a few cents per foot bit-cost, providing

that all the other "bugs" were eliminated. The first problem encountered was the removal of the drill pipe from the hole; the weight of the string of tools, plus the frictional drag on the sides of the hole, was too great for the hoist. This came as a surprise since the machine (as built), had drilled holes equally deep, but they had been wet holes in which the water had acted as a lubricant, thus eliminating the frictional loading. The manufacturer cooperated fully, furnishing a new two-part line and, when available, a more powerful draw-head assembly, both now standard. The "Kelly," or rotating head gears, failed, quite probably from the same frictional loading, but heavier gears, now standard, were supplied. When the joints in the drill pipe froze after swelling the shoulders, new pins with smaller threads and heavier shoulders were substituted, which ended that trouble. At present, we have only one bad problem left, and we believe that we have solved that: it is the breaking off of the fingers on the shifter-collar, a part which should have practically no stress. The approach has been to machine out a seat in the main body of the shifter-collar, and to weld in fingers of rolled steel, in place of the original cast-steel fingers.

Since the arrival of the rotary drill, two men operate the machine, and still have time to build the necessary roads and to assist on other jobs not related to the drilling.

A summary of comparisons will clarify the picture:

	1940	1948	1951
Bench drillers	10	0	0
Secondary drillers	4	3	2
Well drill rigs	0	2	1
Well drill days per hole	—	25	1½
Well drill days repair per hole	—	½	½
Labor and bit-cost per foot	—	\$3.00 +	\$0.75 —

A few words upon the physical characteristics of drilling will clarify the drilling ability of the Joy rotary well drill rigs, as follows:

A jackhammer, wagon drill and Quartermaster, and a sledge and chisel all penetrate a rock by shock and by impact—(chipping).

A diamond-core drill and a grinding wheel are both machines of abrasion—(wear).

A coal-auger and a twist drill exceed the shear strength of the material close to the surface and parallel to the surface—(cutting).

The Hughes tricone bits used on the Joy rotary machines function by exceeding the compressive strength of the stone—(crushing).

How Bit Functions

Since the theory of the operation of the Hughes bit is not generally known to the quarry industry, I will amplify its operation.

The Hughes tricone bit, theoretically speaking, does not penetrate, due to its rotation; instead it penetrates due to the downward pressure on its contacting points or teeth, exceeding the compressive strength of the stone being drilled and causing it to shatter eruptively. Actually, the contacting points or teeth of all three conical rotors in contact with the material being drilled at any one instant equal approximately $\frac{3}{16}$ of the diameter of the bit in square inches. Thus, the contacting area of a $6\frac{1}{4}$ -in. dia. bit is 1.12 sq. in. (This is considering the bit when it has passed its half-life.) If the medium being drilled has a compressive strength in the solid of 30,000 p.s.i., the total down-pressure (down-pressure is the sum of the pressure exerted by the hydraulic jacks, plus the weight of the tools and string of drill pipe) must exceed 30,000 times 1.12 or 33,600 p.s.i. down-pressure to penetrate the medium being drilled. Since the methods ordinarily used in determining the compressive strength of rock do not duplicate the conditions that exist when a tricone bit is working on the bottom of a hole, the above method of determining weight requirements is not an exact method, but it serves to illustrate the process.

The down-pressure is very critical; we cannot just press down at an excessive rate since the tricone bit is composed of three rotating cones, each of which is supported internally by three sets of bearings, one sleeve, one ball bearing and one roller

(Continued on page 138)



By **WALTER B. LENHART**

View of Kaiser Aluminum and Chemical Corp. plant at Natividad, Calif. Surge pile to the right supplies material to heavy-media separation plant, at the foot of stockpile, which removes granite from dolomite

HEAVY MEDIA SEPARATION

Removes Friable Granite from Dolomite

Natividad operations of Kaiser Aluminum and Chemical Corp. demonstrate economy of this method to remove deleterious materials

OVER THE PAST FIVE YEARS considerable data has been published in **ROCK PRODUCTS** describing the heavy media separation process, or H.M.S., as the technique is more often called. Sand and gravel operators who read about the process for the first time

are apt to get the impression that the technique is too involved, due to the new terminology used to describe the process, or too costly to fit into the aggregate processing field. However, when a progressive sand and gravel operator in Canada, the first to use

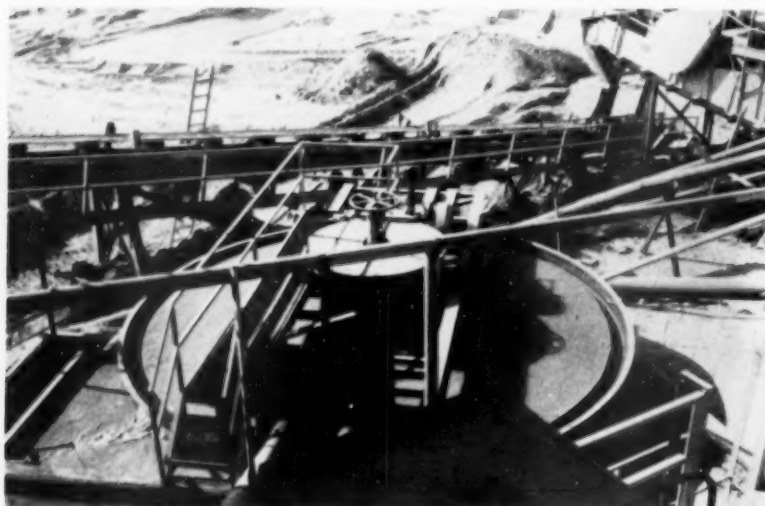
the process, adopted it to remove shale from an otherwise unacceptable gravel aggregate and, at an operating cost of only ten cents per ton, the sand and gravel industry began to take interest. The impact of this interest became more widespread and more fully appreciated when a large Ohio river sand and gravel producer started treating Ohio river gravels by the heavy media separation process during the past year. This large tonnage operation is removing sandstone from river gravels, reducing the Los Angeles rattler test losses sufficiently to easily pass all specifications. This development may have important repercussions throughout the area. A third H.M.S. plant, now under construction in the upper Mississippi drainage area, also will beneficiate gravel.

Those who attend the San Francisco meeting of the National Sand and Gravel Association starting the week of February 22, 1953, can see this process at the Natividad operations of Kaiser Aluminum and Chemical Corp., at their dolomitic lime plant. Natividad is near Salinas, about 106 miles south of San Francisco.

Because of the new interest, the entire subject is being reviewed and the various steps used in the H.M.S.



Primary crushing plant comprises feeder and 36- x 48-in. jaw crusher. Note haulage units and part of quarry in background



Part of the media recovery and storage system is this 20-ft. thickener

process will be described in detail, using the Natividad operation as an illustration to show how and why the H.M.S. process was applied.

The dolomite quarry operations at Natividad were described in *ROCK PRODUCTS*, February, 1952, page 122. The quarry is located on the upper levels of the eastern foothills bordering the Salinas Valley. The deposit consists of large blocks of dolomite intruded by small dikes or intrusions of friable granite and within the blocks themselves are veinlets of siliceous oxides which must be removed to maintain the high standards of quality demanded.

After beneficiation, the quarry product is a high grade calcium-mag-

nesium carbonate with a CaCO_3 - MgCO_3 ratio of roughly 56 to 42, and is the source material for the company's products at Natividad. These are calcined dolomite, high magnesium limes, dead-burned dolomite and sized raw dolomite. The calcined dolomite is used at the Moss Landing seawater magnesia plant of Kaiser Aluminum & Chemical Corp. and at Kaiser Magnesium Co.'s metallic magnesium plant at Manteca, Calif.

The finished product from the seawater plant includes 95 percent magnesia periclase, 92 percent magnesia periclase, dead-burned magnesite grain, rayon grade magnesia, rubber grade magnesia and hard-burned mag-

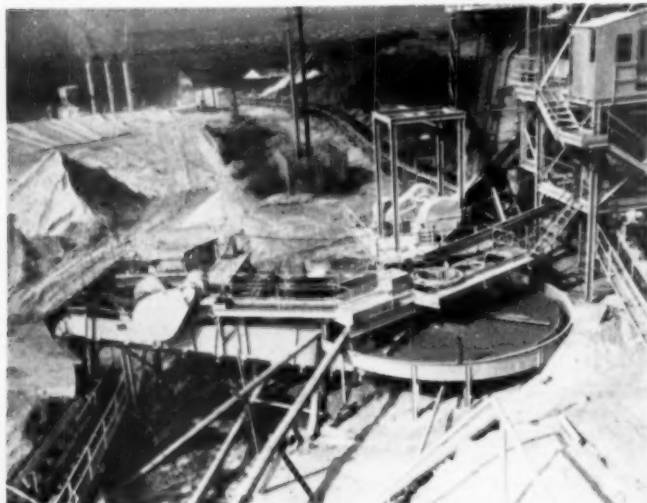
nesia. The refractory brick plant uses periclase and hard burned magnesia from the seawater plant and chromite from the Philippines. The facilities include crushing, drying, screening, fine grinding, and mixing equipment. The prepared batch can be sacked or sent to three 1000-ton capacity dry presses. A tunnel dryer is used for all the green brick. Some of the brick are burned in tunnel kilns, and some are metal encased. The production is about 50 percent brick and 50 percent mortars, and range from complete periclase to straight chrome products with the larger volume being in the 40-60 percent and the 60-40 percent periclase-chromite ranges. The brick products include chemically bonded as well as burned units.

The crystalline magnesium oxide product of the Moss Landing seawater plant is used at the Moss Landing refractory plant to produce basic refractory brick, ramming materials and refractory mortars. Permanent periclase-chrome brick were developed for hot zone linings, and are finding ready acceptance in the portland cement industry for kiln linings. These brick are made with a patented refractory binder and the brick resists chemical attack by the cement clinker in the hot zones and takes a good coating. It is highly resistant to thermal shock and resists to a high degree spalling due to kiln shut-downs.

The material sent to the Manteca metallic magnesium plant is a hard-burned dolomite. The dead-burned dolomite is used as a furnace maintenance refractory in western steel mills. The high magnesia limes are used in putty plants, paper mills and in fertilizers as a ground conditioner.

Right: Scrubber section in background. Belt conveyor in foreground delivers clean dolomite to belt conveyor serving surge pile ahead of calcining plant

Below: Bowl classifier recovers fines from the scrubber section, to the right



BENEFICIATION

The sized, raw dolomites are used in the oil industry for filtration stone, and also for roofing granules, fertilizer filler and industrial and commercial uses.

The heavy media separation process, similar to that used at Natividad, is now about 15 years old. The basic patents are administered by American Cyanamide Co., for American Zinc, Lead and Smelting Co. A small royalty must be paid to the licensee. However, as this royalty is based on the product's value and tonnage, in the case of gravel it is an insignificant amount. To date there has been built throughout the world about 200 H.M.S. plants. About 100 of the total are equipped with Western Machinery Co., Mobile mills. These 200 plants are treating in excess of 50,000,000 tons of material annually and, of this total, some 6,000,000 tons are being treated in industries related to the rock products fields. Several plants are treating gravels, to recover diamonds. Fluorspar, magnesite, brucite, barite, spodumene, limestone and gravel (the latter two for construction uses) are being processed by H.M.S.*

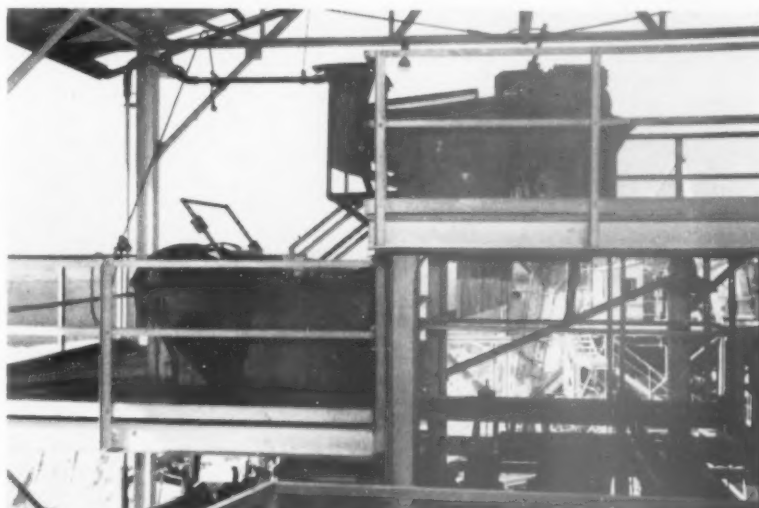
Removing Granite from Dolomite

At Natividad a plus ¼-in., minus 4½-in. material, some pieces of which are slabby and therefore have a maximum dimension greater than indicated, are being successfully treated at the rate of 250 t.p.h. In this process, the stone is fed to a tank containing the so-called medium, a pulp mixture of ground magnetite and ferrosilicon. The heavy stone sinks and the lighter stone floats. Thus the separation is effected.

Methods of separating coarse materials that have a small difference



Lighter material in foreground is the "sink" fraction, and alongside is the darker "float" fraction



Two magnetic separators remove media from entrained fines (sand, etc.). The lower machine is a scavenger unit

in specific gravity have been sought over the years by various technicians. In 1938, it was found that ferrosilicon, or magnetite, or a mixture of the two, when ground to about 100 mesh and made into a pulp, would not settle readily or, to use a modern dairy term, became homogenized. This discovery is the basis of the present H.M.S. process, for not only can a pulp be built up of a high specific gravity, but the relatively heavy medium, being magnetic, can be easily and economically recovered. It was also discovered that the non-settling properties of the ferrosilicon-magnetite medium could be destroyed by simply letting the pulp flow through a magnetic field or coil of a certain type, and conversely, the property of non-settling could be restored to that media by letting it flow through another magnetic field. Both these types of coils have no moving parts, are quite small and compact, use small amounts of electrical current and have an infinite life. There is nothing complicated about their functioning; the pulp flows through the magnetic field continuously and un-interrupted.

A third magnetic device is used in the process and it must not be confused with the two coils referred to. This third magnetic unit is a device that literally picks out the fine ferrosilicon-magnetite from the wash

waters and restores the valuable portion to the circuits. At Natividad, two 48-in., type H.M.W. Dings magnetic separators are used. These operate in series, the first unit recovering the bulk of the magnetic materials and the second unit acting as a scavenger. This device comprises a magnet of high intensity mounted between the top and bottom belts of a short belt conveyor. It is mounted in a shallow steel tank into which the wash waters containing sand, clay and ferrosilicon-magnetite are fed. The magnetic field picks up the material, acting through the moving belt. The magnetic portions cling to this moving belt long enough to carry it out of the tank, after which the valued portion drops from the belt and goes to the storage reservoir. This reservoir, called a

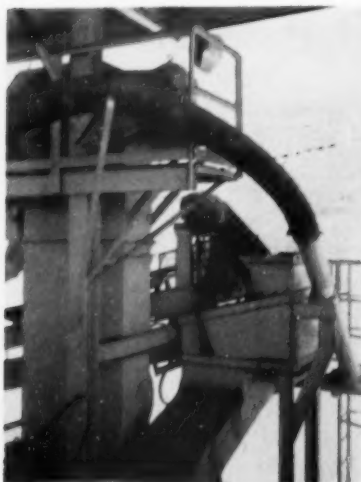


Demagnetizing coil under and following the (densifier) screw classifier. The coil returns the media to its non-settling status. Pulp flows through coil which has no moving parts

*The Heavy Media Separation process was described in the May, 1947, issue of Rock Products, page 72; in June, 1948, page 102; in October, 1948, page 100; data gathered from six or more plants in the United States was reviewed in the July, 1951 issue, page 60; and in the November, 1951, issue, page 64, comprehensive data covering the operations of American Limestone Co.'s H.M.S. plant was described. The article, "Acceptable Aggregates from Low-Grade Deposits," in the February, 1950, issue, page 115, described the use of H.M.S. in the elimination of shale to produce an acceptable aggregate for runways built for the Royal Canadian Air Force.

The heavy media separation process is a method of separating materials out of gravel that are lighter, or heavier, than the gravel itself. It is not currently being used on sand but on materials coarser than 4 mesh.

BENEFICIATION



Pre-wetting with media ahead of cone is done with a hose

"Densifier," is simply a screw-type classifier whose primary purpose is to feed the medium back into the system at a variable and controllable rate. At Natividad a 48-in. Wemco spiral classifier is used. This unit, by varying the r.p.m., or the depth of the spiral, permits the operator to feed the ferro-silicon-magnetite back to the separatory vessel at a rate to insure a uniform density of the medium.

At Natividad, if a medium having a sp. gr. of 2.50 were to be used, everything would sink. If a medium with a sp. gr. of 2.90 was used, everything would float. Therefore, when a media of 2.60 to 2.80 sp. gr. is used, the dolomitic stone sinks, and the granite fractions float. Thus the heart of the process revolves about the necessity of keeping the sp. gr. of the media relatively constant. This is accomplished at Natividad by first having a large cone with a relatively large volume of media in it, for obviously the larger the volume of media, the less the sp. gr. in it is apt to be disturbed by having wet stone at one time and dry stone the next, or, by the inclusions of small amounts of clay in the materials being treated. Clay, silt, etc., even fine sand, in such cases have buoyant values that are in a large measure uncontrollable once they get into the H.M.S. plant; therefore, it is important to exclude these types of slimes from the separatory vessel. Second, the media returning to the system joins the flow of stone to the cone well ahead of the cone; in other words, prewets it so that some stabilization is obtained early. Third, the medium fed to the cone goes down three "media down pipes" which distribute the material vertically in the cone. A revolving agitator, part of the cone assembly, slowly stirs the

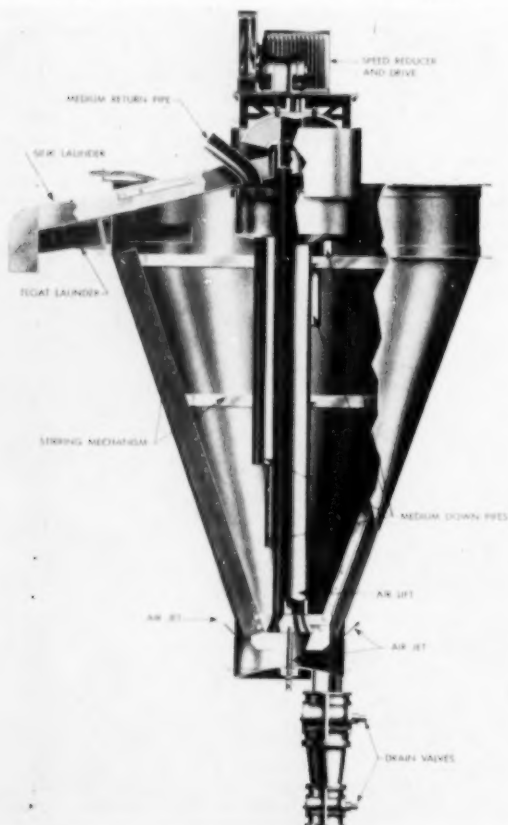
media in the cone to help maintain a uniform sp. gr. from top to bottom in the separatory vessel. The arms move at the rate of 200 peripheral f.p.m., or roughly 4 r.p.m.

Other types of separatory vessels include a rotary drum provided with lifters. The heavier materials sink in the drum and the lifters eventually discharge them from the unit. The drum has high capacity, but if a small difference in sp. gr. exists between the sink and the float fractions, the cone is said to be the better unit. Another separatory vessel, made by Mine & Smelter Supply Co., that recently took over Colorado Iron Works, uses spiral classifiers in a suitable tank. The Link-Belt Co. and Western Machinery Co. both use drum-type separatory vessels.

The operator controls the sp. gr. of the media in the cone by weighing on a set of balances exactly 1000 cc. of pulp. From the net weight of the pulp, tables give the sp. gr. of the media in the cone. The control items are standard equipment with H.M.S. plants.

Preparation of Stone Before H.M.S. Processing

The minus 6-in. stone from the surge pile is moved by a Stephens-Adamson reciprocating feeder to a 30-in. belt conveyor that delivers to a 10-ft. x 66-in. Hardinge conical scrubber. It is powered with a 250-hp. motor and the mill runs at 15 r.p.m. Wave liners of manganese steel are used. To the Hardinge mill is attached a trommel screen with 4 $\frac{3}{4}$ -x 4 $\frac{1}{4}$ -in. oval holes. The Hardinge mill and the trommel are supplied with liberal amounts of fresh water. The plus fraction from the trommel is sent by chute to a 15- x 38-in. Pacific jaw crusher and the crushed dolomite is returned by a small bucket elevator to the trommel. The minus 4 $\frac{1}{2}$ -in. rock falls to a 5- x 12-ft., F-600 Tyrock double-deck screen that has a $\frac{3}{4}$ -in. top and a $\frac{3}{8}$ x $\frac{1}{4}$ -in. wire lower deck. The minus $\frac{1}{4}$ -in. fines flow to



Cut-away section of cone which is 18-ft. dia. and 14-ft. high. The air lift is 11 $\frac{1}{2}$ in. dia. Rabble arms that help keep density uniform operate at about 4 r.p.m. Three media "down pipes" distribute returning media to the cone so that re-mixing with the media already in the cone is almost instantaneous. Drain valves at the bottom are to drain cone if plant shuts down for any length of time or if power sources fail



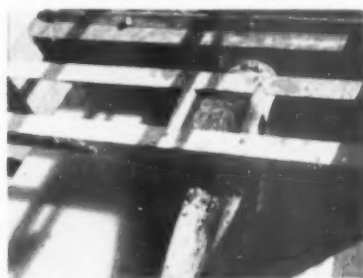
To the right, above, is the 18-ft. dia. cone. Below may be seen the room housing compressors with a combined capacity of 460 c.f.m.

BENEFICIATION

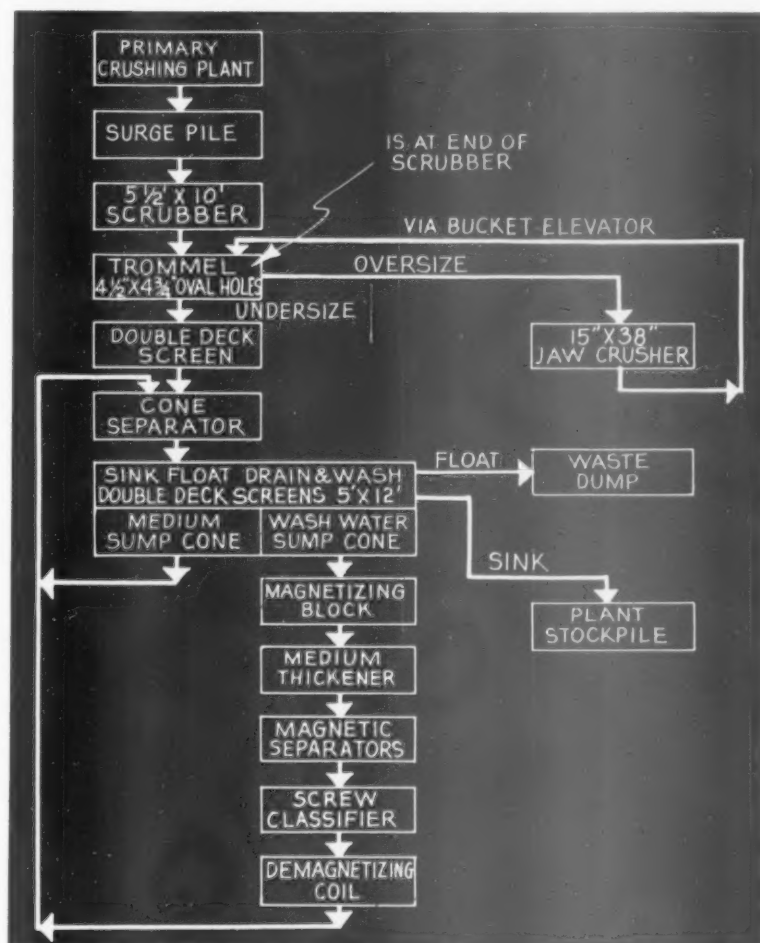
a 20-ft. dia. Dorr bowl duplex rake dewatering unit. Sand from this machine falls to an off-bearing belt conveyor that carries it to the waste storage pile. The overflow from the bowl is wasted. The plus fraction (minus 4½ in. plus ¼ in.) falls to a 24-in. inclined belt conveyor that delivers it to the chute ahead of the separatory cone. The media recirculation pump discharges through a rubber hose into the chute, prewetting the dolomite and washing it into the 18-ft. dia. by 14-ft. high separatory cone. The agitator operates clockwise and causes the whole mass in the cone to rotate. The float fraction is carried around the cone for 270 deg. where it passes out of the cone via an overflow lip.

The heavier materials sink and are picked up by the 11½-in. dia. air lift along with a large volume of the medium. Both the sink and the float fractions pass to two sets of two 5- x 12-ft. Low-Head Allis-Chalmers double-deck screens. The two sets of screens are in series. The decks are divided longitudinally into two separate sections; that used by the dolomite is about two-thirds of the width of the screen, and that for the float or siliceous portion, the other third. The top deck has ¾-in. round punched plate as a wear taker, and the lower deck has ¼-in., or ⅜-in. wire, depending upon operating conditions. The upper 6 ft. of the top screen are used to drain the media directly into the sump pump for immediate re-circulation. The remainder of the screen's surface is, for the most part, devoted to thorough washing and draining of the wash waters from the sink and float fractions. There are 30 spray nozzles on the top deck and 36 nozzles on the lower deck over approximately 12 ft. of the screen's length. The media circulation pump is an 8-in. Wemco that uses about 75 hp., although it is powered with a 125-hp. motor. About 1000 g.p.m. of media is handled.

All wash waters flow to a 20-ft. thickener and, enroute, the pulp flows through the magnetizing block that flocculates the media so it can settle rapidly in the thickener. The thickened underflow, a mixture of ferrosilicon-magnetite-sand, slimes, etc., is pumped by a 2-in. Wemco pump to



Looking down at magnetizing block or flocculating coil ahead of 20-ft. thickener



Flowsheet of heavy media separation operations at Natividad dolomite quarry for removal of deleterious materials

two 48-in. Dings belt-type, magnetic separators located in the upper part of the H.M.S. plant. The material clinging to the magnet, after release, flows to the 48-in. Wemco densifier or spiral. The solids from the densifier, with some water flows to the circulation pump at a sp. gr. of about 3.40. The sand from the Dings separators is wasted. Overflow from the 20-H thickener is picked up by a Fairbanks Morse pump and the water sent to the sprays.

Air for the air lifts is supplied by two Ingersoll-Rand compressors with a combined capacity of 460 c.f.m. Air is used at the rate of 300 c.f.m. at 70 lb. pressure. The air receiver is a 133 cu. ft. unit. Total connected horsepower for the plant amounts to 324 hp. This does not include material conveyors to and from the plant. One operator can run the H.M.S. with a second in the preliminary washing plant which is alongside the H.M.S. plant. Finished dolomite is sent to a surge pile serving the kilns and is weighed enroute on a set of Merrick weightometers.

The cone feed has an average silica

content of 2.39 percent (SiO_2) sometimes running as high as 8 percent. The sink portion, or finished materials, has a silica content of 0.49 percent of which 0.30 percent is inherent in the mass of the dolomite so that the final product has only 0.19 percent of free silica. The float product has an average content of 24.3 percent silica. This latter material is put on the off-bearing belt conveyor, carrying the minus ¼-in. material from the Dorr bowl classifier at the preliminary washing plant and sent to the waste storage pile.

Plant Has Small Media Loss

As to the media loss, at the start of operations the company purchased 140 tons of media. This was all put in the plant circuit as the thickener and densifier had ample storage capacity to hold this amount. Since starting the plant, no more media has been added to the circuit, but if the 140 tons are calculated as all being used, then on the basis of tonnage handled at time of inspection, the loss of media is less than 1 lb. per ton of

(Continued on page 152)

Agstone Producers Seek the Key to Increased Direct Sales

National Agricultural Limestone Institute annual convention covers sales promotion, grassland economy, soil testing, percentage depletion and legislation

NATIONAL AGRICULTURAL LIMESTONE INSTITUTE has made rapid progress this past year, judging from the attendance and the program of activities as outlined at its annual convention held January 19-21 at Hotel Statler, Washington, D.C. This was the second annual meeting since the Agricultural Limestone Institute and the National Agricultural Limestone Association joined forces to form the N.A.L.I. The merger has worked out very well and has resulted in welding together an organization that is growing fast and getting results that benefit the industry.

As of the convention dates, the total active membership had been increased to 265, of which 16 had been added within the two week period preceding the convention and more than 40 during 1952. Additional active members have been added since the meeting which would indicate a membership about one-third greater than at the time of the first convention a year ago. This growth is significant and is substantial proof that the agricultural limestone industry endorses the program that has been adopted and recognizes the benefits being gained from representation in a unified association. In addition, there were 51 distributor members at the time of the convention and 26 associate members. Today, the total membership is approximately 350 with representation from more than 30 states.

The association has made substantial progress both in its legislative functions in Washington and in sales promotion, it being recognized that potential sales of agricultural limestone are far short of needs as proven by agronomists, in order to meet requirements of the nation's soils. In order to finance an increased program of activities, the rate of dues was increased from .4 to .5 of 1 percent of sales f.o.b. plant, effective in 1953, and a budget of \$59,000 was approved.

An expanded promotional campaign was authorized to be tied in with the National Grasslands Program in order to encourage increased use of agricultural limestone. The annual current use, of about 30 million tons, is far short of the tonnage recommended by agronomists of the state agricultural colleges, which stands presently at 80 million tons in order to insure the needed production of food and fiber for our rapidly increasing population.



Mrs. and President K. K. Kinsey of Concrete Materials & Construction Co.

Over 600 producers of agricultural limestone and their guests from 39 states including both coasts were in attendance at the 1953 convention, exclusive of congressional and other government officials, which is a new high for the industry. In addition, there were some 150 congressional guests at the annual reception and banquet.

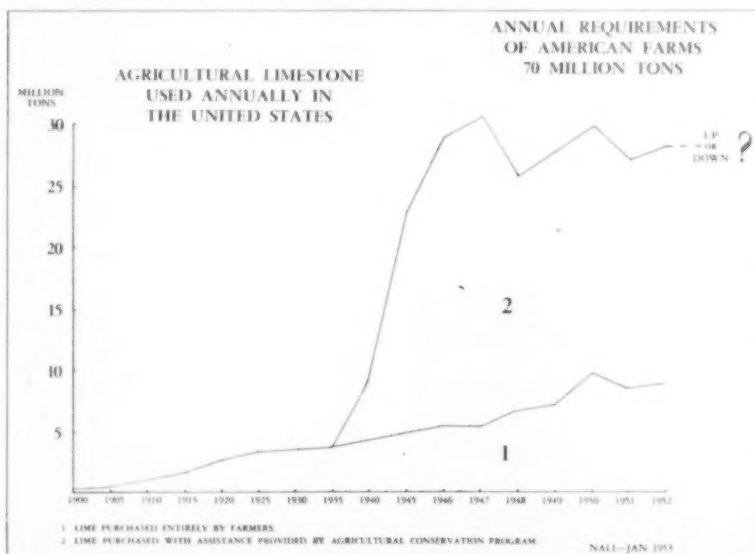
The 1954 annual convention is to be held in Chicago during the month of January, to return to Washington the following year and the annual mid-year meetings have been discontinued.

This year's convention was held during inauguration week, which was an added attraction, that was well received. Many members viewed the inaugural parade and some took the opportunity to participate in some of the events scheduled because of the historic occasion. Much of the pre-inaugural activity was centered in the Statler hotel which afforded a rare opportunity to see celebrities including General Eisenhower, who was a guest at the hotel.

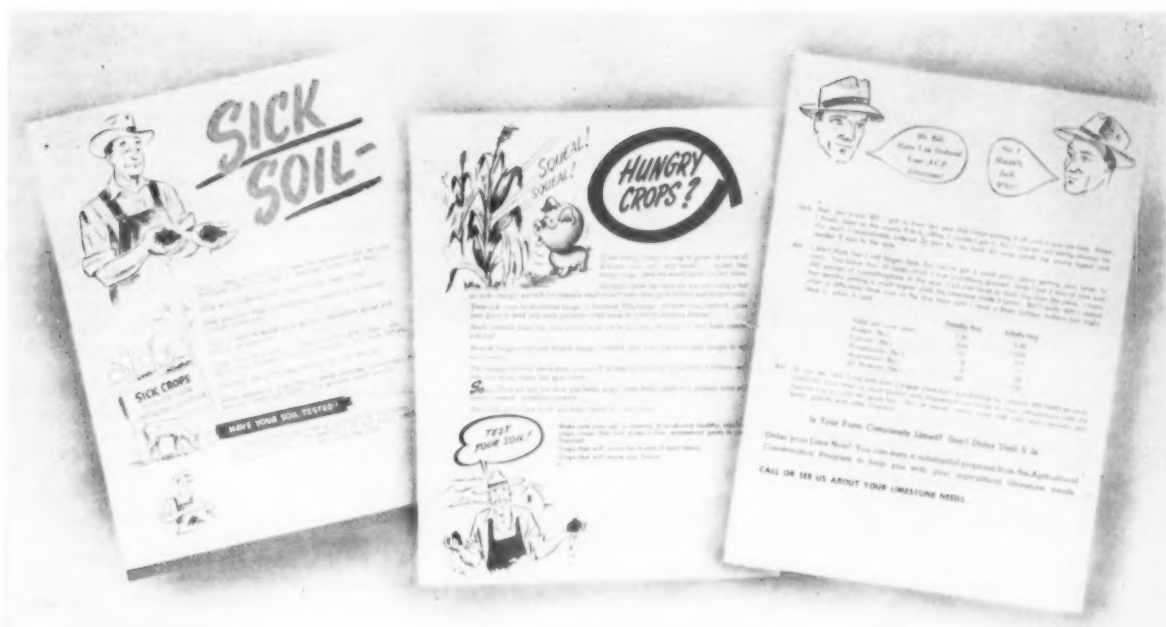
Officers

K. K. Kinsey, general manager, Concrete Materials and Construction Co., Cedar Rapids, Iowa, was elected president to succeed Robert M. Patton. John M. Deely, president, Lee Lime Corp., Lee, Mass., was elected vice-president; Alvin R. Armbrust, president, Fayette Limestone Co., Inc., Washington, C.H., Ohio, was elected treasurer; and Robert M. Koch, Washington, D.C., was re-elected executive secretary.

The executive committee comprises the following: Arthur R. Alvis, Butler, Mo.; Harry E. Battin, Jr., Callanan Road Improvement Co., S. Bethlehem, N.Y.; William S. Black, Black White Limestone Co., Quincy, Ill.; president K. K. Kinsey; Horace C. Krause, Columbia Quarry Co., St. Louis, Mo.; J. B. Mount, Maymead



Curves which show the wide gap between agricultural limestone needs with amounts actually used by farmers



Group of typical advertisements which producers have found effective in promoting sales of agricultural limestone

Lime Co., Shouns, Tenn.; Clarence A. Munz, Eastern Rock Products, Inc., Utica, N.Y.; past-president Robert M. Patton, Plum Run Stone Div., New York Coal Sales Co., Columbus, Ohio; John H. Riddle, Riddle Quarries, Inc., Marion, Kan.; and William E. Stone, Piqua Stone Products Div., Armco Steel Corp., Piqua, Ohio.

Five regional vice-presidents were elected as follows: Sam Davis Bell, Franklin Limestone Co., Inc., Nashville, Tenn.; J. Larry Fay, Material Service Corp., Chicago, Ill.; Leonard S. Fry, Fry Coal & Stone Co., Mercersburg, Penn.; Philip E. Heim, Carbon Limestone Co., Lowellville, Ohio; and John J. Stark, Girard, Kan.

Regional vice-presidents have the responsibility to further the interests of the association within the respective regions and directors are elected from each of the regions according to an allocation system, based on the numbers of members and other factors. This allocation of numbers of directors elected from each region is subject to review annually.

A complete slate of 60 was elected to the board of directors, the allocation being 18 directors for region No. 1, 15 for region No. 2 and 9 each for regions 3, 4 and 5. One third of the directors from each region was elected for a 1-yr. term, a third for a 2-yr. term and a third to serve for three years.

The board of directors comprises the following: Arthur R. Alvis, Butler, Mo.; Alvin R. Armbrust, Washington, C.H., Ohio; Harry E. Battin, S. Bethlehem, N.Y.; William S. Black, Quincy, Ill.; Cletus A. Broecker, Kentland, Ind.; Winthrop L. Bryan, Shakopee, Minn.; William F. Childs, III, Towson, Md.; W. Ray Clarke, Platts-

burg, Mo.; William J. Clark, Munnsville, N.Y.; Charles Coburn, Waukesha, Wis.; John M. Deely, Lee, Mass.; William D. Dillon, Columbus Junction, Iowa; L. R. Falk, St. Ansgar, Iowa; Dana Farber, Franklin, N.J.; J. Larry Fay, Chicago, Ill.; Leonard S. Fry, Mercersburg, Penn.; Elizabeth Gray, Princeton, Ky.; Herbert C. Gray, Tulsa, Okla.; M. M. Green, Carrollton, Mo.; Maurice Greenberg, Joliet, Ill.; Joseph J. Griesemer, Billings, Mo.; A. K. Hausmann, Cleveland, Ohio; Earl L. Heckathorn, Delphi, Ind.; D. H. Henderson, Hamilton, Ontario, Canada; William E. Hewitt, East St. Louis, Ill.; Earl P. Holwadel, Cincinnati, Ohio; William E. Horne, Newton, N.J.; Russell W. Hunt, Neosho, Mo.; E. D. Kelb, Indianapolis, Ind.; K. K. Kinsey, Cedar Rapids, Iowa; Horace C. Krause, St. Louis, Mo.; W. H. Litterer, Watertown, N.Y.; Ralph S. McCrear, Muskegon, Mich.; R. B. McNab, St. Louis, Mo.; W. H. Margraf, Columbus, Ohio; Floyd H. Millen, Farmington, Iowa; Verne C. Morgan, Louisville, Ky.; J. B. Mount, Shouns, Tenn.; Clarence A. Munz, Utica, N.Y.; J. E. Ott, Bay Port, Mich.; Mrs. Stanley D. Pace, Burkesville, Ky.; Robert M. Patton, Columbus, Ohio; Robert J. Pleasant, Tulsa, Okla.; Knott C. Rankin, Rockland, Maine; John R. Rice, Buchanan, Va.; Charles Rich, Swanton, Vt.; John H. Riddle, Marion, Kan.; Fred E. Roberts, Norristown, Penn.; K. C. Ruedebusch, Mayville, Wis.; Robert H. Schneekloth, Lowden, Iowa; Lynn Stewart, Columbus, Ind.; William J. Stoffel, Chicago, Ill.; William E. Stone, Piqua, Ohio; Burt F. Taylor, Cowan, Tenn.; Earl Thomas, Sedalia, Mo.; Paul E. Thompson, New Braunfels, Texas; John H. Wagner, Mead-

owview, Va.; F. Grove White, Stephens City, Va.; F. E. Wholaver, Bellefonte, Penn.; and Myron J. Wurtenberger, Lockport, N.Y. Vincent N. Shea, Adams, Mass., continues as honorary director.

Program

The convention opened with an all-day meeting of the board of directors.

The opening general session was the business session at which the reports of committee chairmen and officers were heard. The remaining sessions stressed promotion, legislation and percentage depletion. In addition there were several excellent talks by top-flight officials of the U.S. Department of Agriculture, outlining the national goals in agriculture and the requirements to make the soils capable of meeting the needs. There were two association luncheons with feature speakers and the convention concluded with the annual reception and banquet which was well-attended by congressional representatives and other government officials as invited guests.

President Robert M. Patton presided over the opening general business session. Following the call to order by the president and the reading of the minutes of the previous meeting, the treasurer's report was heard. Then followed the reports of the chairmen of committees for finance, membership, legislative, percentage depletion and promotion. The executive secretary's report concluded the general session, which was followed by five regional meetings to nominate directors and regional vice-presidents.

Among the main points brought out in the reading of the minutes for the



Officers and directors of the National Agricultural Limestone Institute

preceding meeting by executive secretary Robert Koch were that the practice of holding midyear meetings has been discontinued, and the decision to hold the 1954 annual meeting in Chicago. The fund that had been voted at that meeting in support of the Grasslands Conference has not been spent. Prospective new members no longer require two co-signors in order to be eligible for membership to N.A.L.I.

At the previous meeting it was decided that the association should seek de-control of prices for the industry, which was successfully accomplished in January, 1953. The decision to increase the scale of dues from 0.4 percent to 0.5 percent of gross sales, f.o.b. plant, was another decision of the previous meeting. The new scale becomes effective in 1953.

Treasurer Verne C. Morgan's report brought out that the association is in good financial shape. C. A. Munz, chairman of the audit and finance committee, itemized a budget for expenditure of approximately \$60,000 in 1953. Anticipated income is expected to exceed the budget and it is expected that the net worth of the association will have been doubled as of the end of 1953.

President Patton, who also served as the chairman of the membership committee, presented the favorable report that membership had been increased to 342, including 265 active members. This report was enthusiastically received.

H. C. Gray, chairman of the legislative committee, summed up the activities of a committee that has been very active in appearances before members of congress and congressional sub-committees on agriculture in the interests of preserving a sound agricultural conservation program.

The problem continues to be one of preventing reduction of the conservation program for 1953. Present legislation authorizing the program ends in 1953 and the basic law covering the soil conservation program expires in 1954. The committee will continue to be active in this most important phase of its work. Among accomplishments mentioned were success in obtaining decontrol of prices for the industry and percentage depletion benefits.

Secretary's Report

Executive secretary Robert Koch, in his report, gave a summary of 1952 activities and an outline of plans for 1953. He first expressed his pleasure in the growth of the association and in how well the merger of the two predecessor associations had been accomplished into an organization of strength. He also was pleased at the large attendance.

Among the chief accomplishments during 1952 were getting percentage depletion for the industry, decontrol from OPS and success in keeping the soil conservation program from being reduced below \$250 million for the fiscal year 1953.

Prospects for 1953 and the immediate years beyond are complicated, he said, because congress has been changed completely with the result that there are new men on the appropriation's committee. One of the question marks is the 1953 program now underway which is merely an authorization for which the money must be appropriated by June, 1953. The question also remains as to what authorization might be made for the 1954 program. Whereas past president Truman had recommended that \$250 million be allocated for the 1954 soil conservation program, the question is whether or not his recommendation will stick.

Uncertainty as to the attitudes of key men in Washington with respect to soil conservation and payment-type programs, and re-organization within the Department of Agriculture have combined to make the soil conservation program an uncertainty which is of concern to the agricultural limestone industry. The association intends to be very active in appearances before house and senate committees and to enlist the support of farmers in its efforts. Hearings on appropriations were scheduled to start about February 1. According to Mr. Koch, the soil conservation program cannot be changed drastically for at least a year.

There are also rumors that the P.M.A. program might be placed under the Soil Conservation Service which might also complicate the problem. The economy drive in Washington may also head toward the conservation program as such drives have in the past. The basic law on the books now authorizes expenditure of \$500 million annually but the figure has been cut in half. The principal problem, as Mr. Koch sees it, is to have sufficient funds appropriated and then to fight against too great diversion of the funds to other practices than liming.

Grassland Economy

K. K. Kinsey presided for the second session with R. Willis Stout, Soil Editor of the *Kentucky Farmer*, as the principal speaker. Mr. Stout's subject was "Agricultural Limestone in the Grassland Economy". He has been a leader in this country in the National Grassland Program, is a Kentucky farmer and, through his leadership, his state has developed one of the outstanding promotional programs for improved grasslands and pastures.

Mr. Stout's talk was inspirational, coming from a farmer who knows farming and how to get results. He covered, first, the importance of grassland farming, then the value of liming and its application, and concluded with facts and figures to prove that sound practices pay off in profits to the farmer. Colored slides taken on his own farm were shown to illustrate his points.



Directors, left to right: Wm. J. Clark, Munnsville Limestone Corp., Munnsville, N.Y.; Clarence A. Munz, Eastern Rock Products, Utica, N.Y.; F. E. Whalaver, Whiterock Quarries, Inc., Bellefonte, Penn.; Myron J. Wurtenberger, Frontier Stone Products, Lockport, N.Y.; regional vice-president Philip E. Heim, Carbon Limestone Co., Lowellville, Ohio; director Wm. F. Childs, Harry T. Campbell Sons' Corp., Townson, Md.; Leonard S. Fry, Fry Coal & Stone Co., Mercersburg, Penn.

Good grass, he pointed out, is the foundation for our daily living, in raw form, being the basis for our daily diet and body protection (clothing). Grass vegetation and its decomposition formed our good soils, he reminded, contributing the properties essential for fertility. Grassland farming can be the means of converting our wastelands and eroded soils into fertility, he emphasized, and he said that the farmer who has a grassland foundation is fortunate and has no problem in making a profit.

Efficient grassland farming is impossible without the use of agricultural limestone. Agstone, while it constitutes a plant food, is important principally for the correction of acidity and because of its ability to release nutrient elements for take up by the plants. The degree of benefit is related to the pH of the soil, and agstone is the means by which the farmer can get best results from both native and artificial fertilizers. Legumes, he pointed out, can starve in unlimed soils even if they be fertilized.

Promotion

An entire session was set aside for a panel discussion on promotion under the chairmanship of William E. Stone, Piqua Stone Products Div., Armco Steel Corp., Piqua, Ohio, who is also chairman of the promotion committee. This session was by far the best we have heard on the subject. It was obvious that the industry is concerned that farmers continue to be hard to sell on the benefits of liming, and that there has been a growing realization that the promotion of liming is essential to the continuance and growth of the industry. Billboard advertising, direct mail, newspapers, news releases and radio advertising were discussed.

The committee had met this past March to work up a plan of promotion and, among other plans, accepted the idea of billboard poster advertising which is available through the Iowa Agricultural Limestone Association.

Mr. Stone cited the fact that the industry is now selling at the level of about 30 million tons of agstone annually whereas the Department of Agriculture says that 495 million tons must be applied to bring the nation's soils up to standard with an added 50 million tons applied annually to maintain soil fertility. Thus, the industry has a sizable market to shoot for and the question is how to go about it.

A chart was shown of the use of agricultural limestone annually since 1900, which showed that so far the largest amount continues to be purchased by the farmers with ACP assistance. However, there has been a slow trend upward in the amount purchased entirely by farmers, with a peak of some 10 million tons as compared to a total of about 30 million

(Continued on page 118)



Directors and officers of the association. Left to right: Robert H. Schneckloth, Lowden Rock Products Co.; retiring president Robert M. Patton, New York Coal Sales Co.; William E. Horne, Limestone Products Corp. of America; H. L. Manwaring, assistant deputy administrator of PMA, luncheon speaker; Charles Coburn, Waukesha Lime & Stone Co.



From left to right: L. W. Ewald, G. E. Ackland, M. R. Ackland, C. C. Ewald, all of Stoneridge Limestone Co., Rochelle, Ill.; Rallie Schneckloth, High Test Lime Quarry, McCausland, Iowa



A group of New Yorkers at the banquet: Mr. & Mrs. W. E. Hess and Mr. & Mrs. M. F. Alvord of Solvay Sales Div., Allied Chemical & Dye Corp., Syracuse; R. L. Maxwell and M. L. Dake of Coop GLF Exchange, Ithaca; and Mr. & Mrs. George W. Mintz, Michigan Limestone Div., U.S. Steel Corp., Buffalo



From left to right: J. G. Hawthorne, Whiterock Quarries, Bellefonte, Penn.; Ammon S. Green, Highland Stone Div., New York Coal Sales Co.; Robert M. Patton, retiring president; Paul E. Ryan, and Leo L. Davis, Highland Stone Div., New York Coal Sales Co.; Victor Valach, Vermarco Lime Co., West Rutland, Vt.; Mr. & Mrs. Knott C. Rankin, Rockland Rockport Lime Co., Rockland, Maine; Mrs. Victor Valach; Wm. C. Gerhart, Fry Coal & Stone Co.; and F. E. Wholaver, Whiterock Quarries, Bellefonte, Penn.

Accident Prevention Program That Works

First of a series of articles on the safety program of The Warner Co., and the methods which have made it effective

By LEA P. WARNER*

THE SUCCESS and basic effectiveness of any safety program depends entirely on established company policies, the people who administer them and those who must work under them. It has often been stated that one person alone cannot succeed but all of us working together can stop accidents. In my opinion, organization is a basic requisite to a sound safety program, the essentials of which I would briefly enumerate as follows.

Top Management's Support. Full support is needed, not lip service or sanction that appear to be done in industry today. By support we mean actual participation, true undeniable interest emanating from the fact that management is sold on safety. Safety is good business and all operating men shall be held as responsible for the safety of their workmen as they are for meeting production schedules and quality of materials. (This phase will be elaborated on in detail in future articles.) The Warner Co. management is wholeheartedly backing the company safety program.

Basic policies, procedures and practices must be established as a guide, rules of the game, etc. It becomes a staff function to clear these with all

Van Sciver plant screen house and bins with American flag and National Safety Council's Distinguished Service to Safety award pennant for better than a million accident-free hours, flying above

echelons of line or operating groups, or if the company is small, by the "big boss" himself. In the Warner Co. our 1500 employees are broken down into 11 major divisions, the largest of which includes about 375 employees and the smallest 45. As the company personnel and safety manager, I have the job of coordinating the safety activities of these 11 divisions to work with them in solving technical problems of safety engineering that arise and to further the knowledge and interest in the science of safety engineering generally.

The plant organization and safety program. At all of our plants this organization differs, sometimes due to size or nature of work and/or the personalities of individuals administering them. Regardless of the type of organization, I have learned through

my years of experience that many important operating problems have come to light and have been effectively settled through the safety organization. Certainly this is no surprise to modern management and I know that all of our plant superintendents would be the first to acknowledge the value of the safety organization in expediting operating problems. We have learned that safety pays. A plant that has learned to operate safely must operate efficiently. There is no price on safety. It becomes an integral part of good business practice.

Through this plant safety organization individual worker incentive and responsibility can be easily developed and both men and management may learn to work together harmoniously for the good of the company and its employees.

A safety program does not have to be an elaborate affair; in fact, the easier the better. However, if the local groups wish to dress it up, let them exert their interests. Our safety program includes safety meetings, inspections and posters, movies and plant publications. These are expanded or are not carried out in accordance with local plant intent and requirements.

Briefly at our limestone mine every man is schooled in the essentials of first-aid. Why? Because he may be working miles from any first-aid station and the knowledge of control of serious bleeding and stoppage of breathing can be mighty important. At this same location monthly departmental safety meetings have been successfully carried on. They give the foreman, who conducts them, an opportunity to discuss safety with his men and he often learns about some



Close-up of safety council's Service to Safety award pennant and gang of workmen who won it

*Safety Engineer, The Warner Co.

SAFETY

peculiar hazards and operating practices that need immediate correction. Just one valuable idea would more than offset the time lost in holding these meetings. Any way—let's be honest about it. The 15 minutes added at the end of the lunch period probably didn't result in any loss of production. Think also of the fine relations being established between men and foremen. Is that not worth something?

One of our plants is fortunate in having a sign painter on the payroll. This plant goes in for elaborate safety signs and neat lettering of the exits, close clearances, electric switches, etc. Still another plant has a man who thinks up new ideas for publicizing safety and an outstanding job has been done in this manner.

If someone asked me which of our programs was best, I think I would answer by saying "all" because we must not lose track of the fact that the local plant interest and activity is essential to its effectiveness and the individual responsibility and pride through self expression is our American way of doing things.

In reality, their work, their findings, their methods of finding ways to correct hazardous conditions and practices have been my greatest source of learning, which I then endeavor to impart to other plants which are likewise interested in improving knowledge about anything that will enhance the Safety Program. Keep the boys interested.

Medical and compensation. Some people may differ with me on this phase of a safety program and I have been through many an argument regarding it. In future articles I would like to dwell extensively on our experiences; however, a brief statement must suffice for now.

Through our first-aid work we endeavor to bridge the gap between moment of injury and the time when the doctor or hospital may take over. We feel that qualified care during this

period results in a less severe injury and good follow-up of the minor treatments will prevent infections and cut down the number of cases that might otherwise have to be sent to the doctor. We have a corporation of doctors who regularly examine our employees and treat them for injuries. Addition-

Editor's Note

● IF WE WERE to analyze several hundred successful safety programs, we would probably find no two alike. Likewise, within one organization itself there may be as many safety programs as there are plants. This statement is certainly true as far as the Warner Co. is concerned. This company has its main administrative offices in Philadelphia and from this point line plants, one 200 miles west and another 25 miles west of Philadelphia, are controlled, while directly north along the Delaware river are the gravel plants some 30 miles away. The river transportation division's tugs and barges carry the materials to six retail yards, including one Wilmington, Del. These yards are primary central-mixed concrete operations with hauling being done by company-owned trucks. Each subdivision of this 159 year old company has through the years developed a safety program peculiar to its own problems, but adhering to the basic policies and procedures administered out of the main office. The organizational set-up of this company sets forth some interesting points of this important phase of any business.

ally, the trained nurse is able to carry out the doctor's prescribed treatments for back injuries, bruises and burns in such a manner as to permit the



ROCK PRODUCTS' safety trophy and those who played an important part in winning the National Sand and Gravel Association award

employee to lose very little time from work and to rehabilitate him quickly and completely. In time she gets to know the boys and their families and even shares their medical problems, which incidentally are between herself and the employee and no one else. The employees know this and work closely with the nurse, who is often able to further their knowledge of medicine, care of teeth and health generally. They become better employees and the company also gains indirectly. Absenteeism due to health has been reduced, which is most important in this day and age of more and more vacations. A foreman, particularly in a small plant, just can't operate if one man is off due to injury, another due to illness and a third scheduled for vacation. It can become a problem—just ask your foreman.

Finally, we feel that our over-all safety program coupled with our medical program greatly reduces the number of compensation cases, which means less time lost by employee, a minimum of suffering and considerably lower costs to the company. The savings, as a result of the fewer compensation cases, are greater by far than the sums spent to prevent these injuries and to care for those who are injured.

Move Offices

UNITED STATES LIME PRODUCTS CORP. and its sales division, Arrowhead Lime & Chemical Co., recently announced the removal of its Los Angeles offices to 175 S. Alvarado St., Los Angeles 4, Calif.

Gravel Company Sold

RIVERSIDE GRAVEL CO., Mandan, N.D., was recently sold to Paul Wachter, Eugene Wachter and Maurice Ratzlaff, Bismarek, N.D., who will operate the plant under the name of Riverside Gravel.



Left to right: John Curtin, Jr., president, presenting his annual large-plant trophy to Guy Johnson, plant chairman of the safety committee. The occasion was the winning of the 940,000 man-hour safety record achieved by lime mine and plant at Bellefonte

Theory and Practice of

LIME MANUFACTURE

By VICTOR J. AZBE*

First of a series of articles which will bring up-to-date scientific data on lime manufacture based on research studies

LIME KILN PERFORMANCE possibilities depend on many factors. Of these the time required for calcination, that is, the relative effect of heating conditions, of size of stone and of its composition, is the most important. The writer has investigated this intricate but fascinating subject experimentally over many years, with an ever increasing degree of appreciation and determination. In addition the work of other investigators, Berthold Block, Haslam and Smith, C. C. Furnas and N. V. S. Knibbs, was analyzed.

All helped in throwing light on one or another phase of the matter, but none has left a suitable practical interpretation to fit either the vertical or rotary kiln. There also is great divergence in results, calcining time of one being several times higher than another. However, it could hard-

ly be expected that they would agree unless they used precisely the same equipment and samples in precisely the same manner.

Time of calcination is dependent on many variables. To mention only a few, the stone size, shape, its orientation to heat supply, density, nature of its porosity, composition, and component matter distribution.

With respect to the furnace or kiln, the question is whether calcination takes place in a flowing stream of gas, in which case, what is the rate of flow? In the latter case, in addition to convection heat transfer, which may be slight, there is the direct radiant heat impact from radiant elements much hotter than the furnace. So there are various combinations of convection and radiation heat transfer rates prevailing in different experimental furnaces and kilns and

even in different portions of the same furnace or kiln, although all supposedly may be operated at the same temperature. It is a tricky state of affairs indeed.

These are by no means the only considerations, but apart from these it is plain that two investigators starting out independently could hardly arrive at the same answer. It is not that their conclusions may have been wrong. They quite likely were right for the existing conditions, but in reference to any other set of conditions they were wrong. Thus while their work may have proved stimulating and in a manner enlightening, it is of slight practical value.

There are many types of furnaces, gas heated, electrically heated, stationary and rotary; of these the rotary is the least satisfactory because the exposure of the contents is the least definite. Some sizes of the component mass will ride the outside of the mass and other sizes will never penetrate to the surface.

Haslam and Smith indicate a very high calcination rate (Fig. 1), due to a highly radiant state; C. C. Furnas' results were also high, in this case due to forced convection. How N. V. S. Knibbs obtained his results we do not know, but his results could be varied up and down the chart by varying either the gas velocity, the radiation characteristics or surface orientation.

At the same temperature we may have a surface heat transfer of 3 or 30 B.t.u. or more per square foot per hour per degree Fahrenheit of temperature difference, which is demonstrated in a practical way by the fact that some kilns produce five times the lime that other kilns of equal size and temperature conditions do.

From this it may seem that such tests are so unreliable as to be useless, but this is not so. Properly conducted and with results properly interpreted they can throw much light on the subject and reveal what the ultimate possibilities in kiln performance may be and point the way towards attaining them.

Calcination time is first a matter of conditions prevailing externally of the stone, conditions which govern the heat supply to the stone surface.

Editors' Note

THIRTY YEARS AGO a young man, who had already achieved a national reputation as a combustion engineer, began to take a lively interest in improving heat economy in lime manufacture. That also was when the editor of ROCK PRODUCTS discovered him and the work he already had accomplished in this industry. During the succeeding years there have been few issues of our journal without a "progress report" on our author's development of new scientific information on his chosen subject. The constant study and the resulting constant evolution of lime kiln design has been not merely his life work, but we might almost say an obsession with Victor J. Azbe.

It is altogether fitting and desirable that this journal, which first made the lime and cement industry of the world acquainted with our author and his talents, should now begin publication of a series of articles in which he will summarize and bring up-to-date, the developments and scientific data of his

lifetime of research and engineering practice. The articles appearing heretofore have been of particular interest and value in that they have shown to the faithful and continuous reader the actual unfolding of special knowledge in the mind of the author. Consequently the present reader who is familiar with these earlier articles will find some changes, which merely emphasize the greater value of the present series, as an example of the mature wisdom that comes only from the constant trial and error, unavoidable if one is to carry into practice ideas which at the time they are propounded may be considered too radical to be generally accepted. Now, no one with sound scientific knowledge of lime manufacture any longer doubts them.

—THE EDITORS



Victor J. Azbe

*President, Azbe Corporation, St. Louis, Mo.

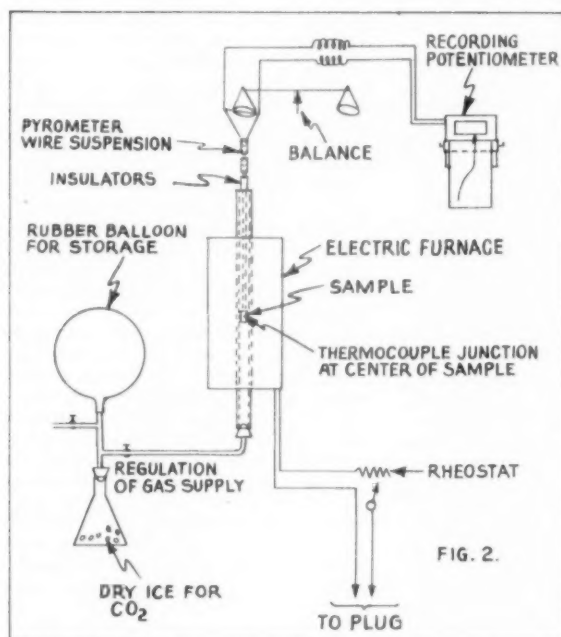


Fig. 2: Apparatus for simple simultaneous temperature and weight loss determination

Second, it is a matter of temperature of calcination, and of preheating and calcining reaction heat requirements. Third, it is a matter of extent of external surface, of exposure of this surface, conductivity of stone and lime and required calcining depth. Fourth, there is the complex state of affairs prevailing at the interfacial region between the lime and stone where calcination is actually taking place, a state requiring much further study which now is being given.

All of these conditions and others govern the kiln performance and the required kiln design. They should be known in as much detail as possible, but they cannot be studied in the kiln. It is only possible to do this under controlled conditions in the laboratory.

Instrumentation

During some of the described tests a Burrell tube furnace was used. Its advantage is that high temperatures may be attained. Its disadvantage is that the heat source is to one side only. It would have been entirely unsuitable if special care had not been exercised. Since this was done, check results conducted in furnaces of four heat sides gave substantially the same results.

Laboratory furnaces can have quite as many idiosyncracies as actual kilns, and at no two points would temperatures or heat supply be the same. Further, one can not be sure that the inserted thermocouple is actually registering the correct temperature at the couple junction, and particularly not at the sample.

Therefore, only one stone specimen was tested at a time. It was mounted

free of the floor of the furnace and each succeeding sample was located as closely as possible to that of the original sample.

Furnace temperature by the regular couple was taken but not relied on completely. In addition there was a second couple located adjacent to the sample. Then within the center of each sample of stone was a tightly imbedded third thermocouple, which permitted the temperature history of the sample to be followed throughout the test.

Furnaces are so unreliable that we believe this latter precaution is always necessary. In some of our check tests, not only was this center couple used, but in addition the sample was suspended from a weighing balance, making it possible to trace its weight change from moment to moment and correlate this with temperature (Fig. 2).

In still other tests two couples were imbedded, one immediately under the surface of the stone, the other in its center, and when it was deemed desirable the furnace atmosphere was controlled for CO₂ content. The whole arrangement was very much as that illustrated in Fig. 3.

Samples and Test Groups

The stone samples were cubes or slabs of determinable size ratio and surface. Most of the work was done on cubes. The stone used in some of the tests was Indiana oolitic limestone, a well-known, light, porous stone of a specific gravity 2.258. Other tests were run with dense heavier stone, both high calcium and dolomitic, pure and impure. Of all the stone

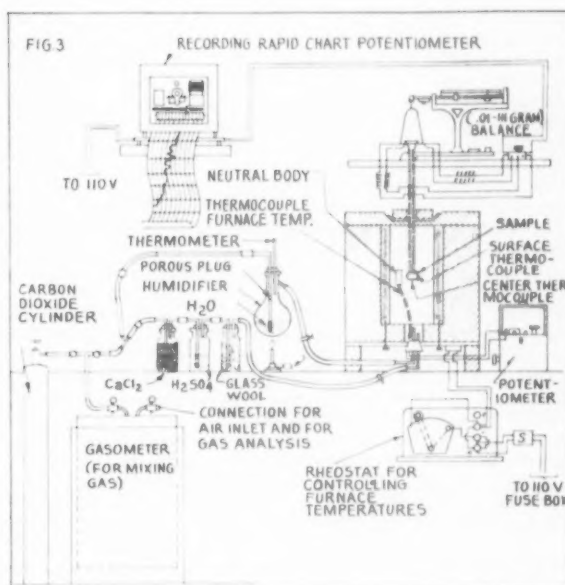


Fig. 3: Apparatus for the study of reactions and heat transfer of calcium and magnesium carbonates, oxides and hydrates. Additional equipment includes Orsat and sampling tubes for gas analysis of gasometer and furnace, and an asbestos sleeve to shield sample from radiation

samples and of all lime obtained therefrom, specific gravity was determined by forcible immersion and mercury, with the aid of the apparatus arrangement and procedure illustrated in Fig. 4.

In the first group of tests, size of the stone was constant, but temperature was varied. Cubes were of nominal 1½-in. size with but slight variations which, however, were determined and allowed for. Tests were to be run in 200 deg. F. steps, but since it is difficult to establish a furnace at an exact temperature level the closest possible to this was maintained, at 1725, 1900, 2100, 2270, and 2490 deg. F.

In the second group of tests, the

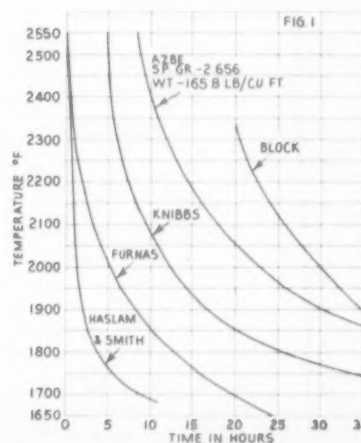


Fig. 1: Effect of temperature on calcining time using 6-in. stone

temperature was maintained at a constant 2100 deg. F. and the size of cubes was varied, as 1 in., 1½ in., 1¾ in., 1¾ in., and 2 in.

In the third group of tests, temperature again was maintained constant, and so was the thickness of the stone, but the oblong dimension was varied. The samples ranged in size ratio from 1 x 1 x 1 cube with 1 being ¾ in. thick, through ratios of 1 x 1 x 2, 1 x 1½ x 2, 1 x 2 x 3, and 1 x 3 x 4, the last being quite a flat, slabby specimen.

It was deemed necessary to run these tests on regular size sawed pieces as otherwise neither surface, calcining depth or penetration rate would have been known, and the heat transfer rate could not have been calculated and correlated with furnace temperature and with size and shape of stone.

The samples were small, but it is only on such small samples that controlled tests can be run. Thus accurate information was obtained, which was interpreted later for larger stone.

The interest was not only in the time of calcination but in the probable effect of the rate on the quality of lime produced. This will be covered only partly now but more completely in that part of the series to be devoted entirely to the production of quality lime.

Effect of Temperature on Time

In Fig. 5 we present the results of five independent tests, with the curves numbered 1 through 5. These indicate the specimen's center temperature plotted against time, while the upper curve is plotted with furnace temperature against time. The circles on this curve indicate the temperature at which the furnace was maintained, and also the time required for preheating and to reach the end of calcination. Beyond these circles, for each curve, there is additional time involved in the overheating of each sample to the furnace temperature.

In each case, before the sample was inserted, the furnace was fully preheated to the temperature indicated by

the circles, and maintained at that temperature with but a few degrees variation. It was thus possible to derive the temperature difference which prevailed during any part of the test between the furnace proper and the specimen center. With lime weight, corresponding heat requirement, and surface for each cube being known, the net heat transfer rate could be calculated and reduced to B.t.u. per square foot per hour per degree Fahrenheit. These are the only calcination tests we know of where this was possible.

The stone in these tests was the typical, porous, Indiana limestone of a specific gravity of about 2.258, weight solid 141 lb. per cu. ft. Had specific gravity been greater, calcination time would have been proportionately greater. This direct relationship applies in most cases, but there can be exceptions which will be discussed. The calcination time would of course have been different in the case of dolomitic or hydraulic limestones, which also will be taken into account later on.

As the furnace in this case was not charged with CO₂, slight surface calcination started when it reached calcination temperature, this being prior to full preheating of the stone, at a center temperature of 1300 deg. F., indicated by line A (Fig. 5). Between lines A and B, both preheating and calcination proceeded. At B the curves level out, there is no further preheating of stone, only calcination at a rate corresponding to the amount of heat supplied to the surface modified by the rate of heat subtracted from its surface by calcining of the specimen. Since subtraction was increasingly less the deeper the specimen was calcined, the surface temperature became increasingly higher, and the temperature difference between the furnace and surface less.

At C calcination is mostly complete and overheating of the lime begins. That the upturn is slow reveals that there are resistant residuals to calcination, which require a higher temperature, such as for example dense calcite crystals. This is generally recognized and some overheating is always necessary if lime of high availability is to be obtained. At D, however, the second upturn, calcination is complete for all practical purposes and thereafter rapid overheating takes place.

The lines are temperature lines at which the samples were calcined. The area thereunder represents the time-temperature calcining effort.

The rate of preheating is extremely fast, only 4 min. to incipient surface calcination of No. 5 and 6 min. for No. 1. The preheating was so fast because temperature difference was higher than in any kiln, but even with this considered, it is apparent that the problem of lime making is not centered in the preheating, but

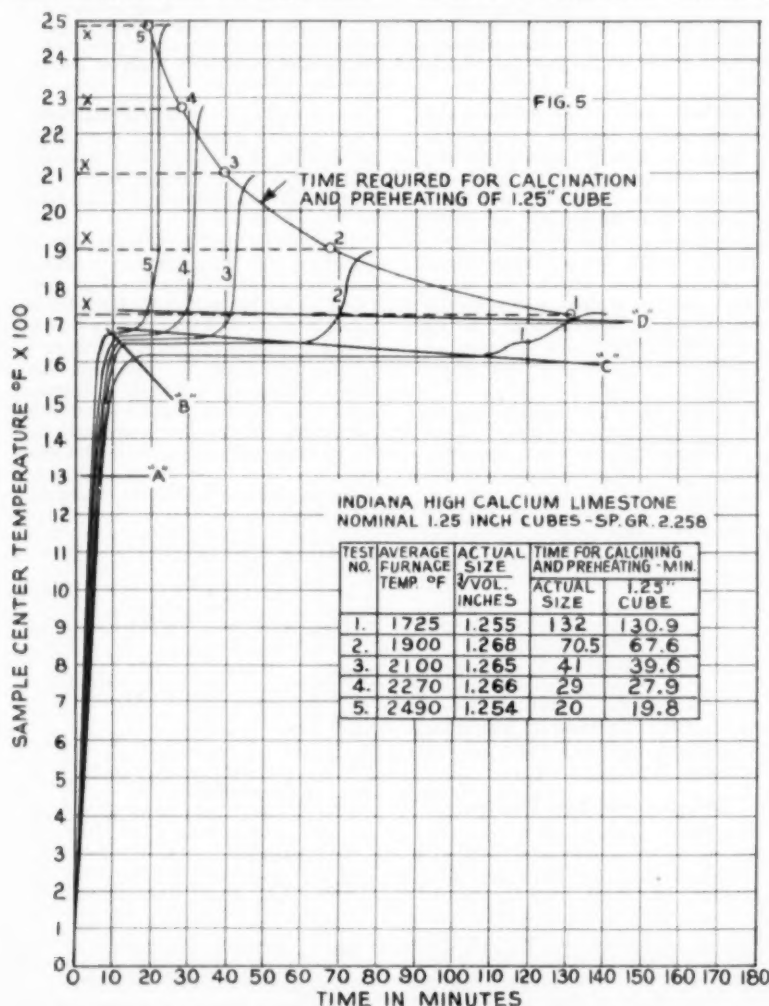


Fig. 5: Effect of temperature on rate of preheating, calcining and overheating

rather in the calcination process. This is more so the lower the calcination temperature of either kiln or test furnace.

The extremely high overheating rate after completion of calcination above line *D* is surprising. This of course is faster the higher the furnace temperature, and for sample No. 5 only 3 min. were required from calcining completion for it to attain the maximum temperature of 2490 deg. F. This is partly because the outer portions of the sample had been heated up earlier, and it was only necessary for the heat to penetrate to the center, which required the 3 min. However, it is extremely fast when considering that lime is porous and of low heat conductivity. This characteristic of rapid overheating has an important bearing on the matter of lime quality impairment.

Table I presents the data from which net surface heat transfer rate *h* was calculated. The mean temperature difference was obtained by planimeter measurement of the area on the chart. The surface area and weight of the cubes were determined. All surfaces were exposed to heat.

The "net" heat transfer refers to all retained heat and does not include the heat in escaping CO₂ between the lime surface temperature and calcining temperature.

Interesting to note is that, in spite of the great difference in furnace temperature and in temperature difference, the rate of heat transfer in B.t.u. per sq. ft. of exposed outer surface, per hour per degree temperature difference, was virtually the same for these equal sized specimens. The area embraced by the curve of the high temperature test of No. 5 was equal to the area embraced by curve of test No. 1. Temperature difference was convertible into lime, as time \times temperature difference was close to constant for all tests.

The temperature difference prevailing during tests Nos. 1, 2, and 3 may be considered practicable from the kiln standpoint, while those of tests Nos. 4 and 5 are rare and would never be encountered in kiln practice.

Calcination was thus rapid due to the high surface heat transfer rate and to all of the surface being exposed to heat. The high heat transfer was due to the predominant radiation effect, but an equally high heat transfer rate may be obtained in kilns through forced convection, with radiation heat transfer being replaced in part by high convection heat transfer.

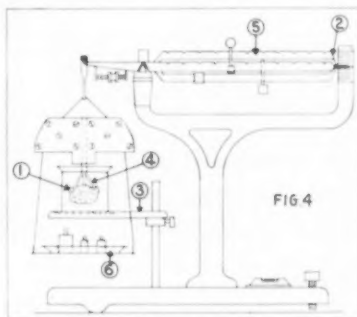


Fig. 4: Apparatus to determine specific gravity of samples. Procedure follows: (A) Determine weight of sample "A" in air. (B) Set and lock pointer 2 at zero balance position and adjust platform 3 so mercury level is at gauge mark on immersion prong 4. (C) Release 2 and balance by weighing system 5; leave weights in this position for rest of determination. (D) Place sample 1 under prong and immerse in mercury. (E) Repeat step B, above. (F) Release 2 and balance by weights at 6; this is weight "B". (F) Specific gravity of sample =

$$\frac{\text{Specific gravity of mercury} + "A"}{"A" + "B"}$$

Specific gravity of mercury at 68 deg. F. = 13.5462

As to surface "exposed," this is a matter of type of kiln, of kiln design and of stone selection, all of which is to be covered later on.

The horizontal section of the calcination curves are not of the same temperature level. That of No. 3 is far below 1648 deg. F., seemingly to be explained only on the basis that CO₂ concentration below the calcining face is less than 100 percent. That can only be true if Johnston's theory is right, that there is a degree of air penetration into the inner regions of the relatively small sample by diffusion, there reducing CO₂ tensions and with this the dissociation temperature. By contrast the calcination line of sample No. 5 is far above 1648 deg. F., which may, however, not necessarily mean a higher CO₂ tension than atmospheric, although that is likely. It may mean, rather, a temperature build-up at the calcining face, which in fact may be the real cause for the shorter calcining time.

The calcining rate was very high and increasing but at a reduced rate with rise of temperature, doubling for 250 deg. F. at the lower temperature level to 450 deg. F. at the upper temperatures. A higher rate could have been obtained for the same furnace temperature if surface conductance and radiation impact had been increased by some means.

Some Practical Inferences

The aim should not be to attain high rates through high temperatures for that leads to poorer lime. It should be rather toward lower temperatures such as of tests Nos. 2 and 3, which are not likely to harm lime even on prolonged retention in the kiln. At these lower temperatures the high rate can be obtained through an increase of surface, improved surface exposure and improved over-all heat transmittance.

Then, it also must be considered that in the case of actual kilns, high temperature could prevail only at the end of the calcining zone. Through most of the kiln the temperature would be progressively lower, otherwise kiln efficiency would be inversely poorer.

The samples used in these tests, the 1½-in. cubes, were the size of normal rotary kiln stone. Conditions of test No. 5 represent the average temperature of the hot zone of a rotary. In the furnace, the calcination time between lines *B* and *D* was 10 minutes. In the rotary, the time required is over an hour.

Preheating time up to line *B* of specimen No. 2 at normal average rotary kiln preheating zone temperature of 1900 deg. F. required 10 min. In the rotary, preheating time ranges up to 2 hr., because in the rotary heat lacks access to the surface and convection heat transfer is at a minimum.

(To be continued)

Lime Meeting

THE NATIONAL LIME ASSOCIATION, for the first time during the 50 years of its existence, will hold a lime meeting of national scope in the "Deep South," October 12-14, 1953, at The Tutwiler Hotel, Birmingham, Ala. This is expected to be an outstanding operating meeting, since Shelby County, Ala., is the fourth largest lime producing area in the United States. This section features modern, large capacity, vertical kilns of various types and a new, completely modern, rotary kiln lime plant, which is scheduled for a visitation tour during the meeting.

M. A. Rikard, Southern Cement Co., Birmingham, Ala., is program chairman for the meeting, and F. J. Collins, The Kelley Island Lime & Transport Co., Cleveland, Ohio, is operating division chairman.

Western Phosphate Plant

STAUFFER CHEMICAL CO. AND GARFIELD CHEMICAL AND MANUFACTURING Co. recently announced that their proposed new multi-million dollar superphosphate fertilizer plant at Garfield, Utah, near Salt Lake City, will be known as Western Phosphate, Inc. Building permits totaling \$9,850,000 have already been issued for the plant which is expected to be completed sometime in 1953.

Table I. Heat transfer rate *h*
Specific gravity of stone 2.258

Test sample	Specific gravity of stone 2.268		Weight/Cu. ft. solid 141 lb.		
	1	2	3	4	5
Furnace temp. deg. F.	1725	1900	2100	2270	2490
Mean temp. diff. furnace and core deg. F.	148.2	309.2	563.4	768.4	1048
Time of preheat and calcination—min.	132	70.5	41	29	20
Size of cube—cubic inches	1.2545	1.268	1.265	1.266	1.254
Weight of cube—lb.	0.1607	0.1661	0.1650	0.1656	0.1605
Surface per cube—sq. in.	9.444	9.654	9.600	9.624	9.432
<i>h</i> —B.t.u./sq. ft./hr./deg. F.	15.78	14.34	14.51	14.00	14.72
Average <i>h</i>			14.47		

MILLISECOND DELAY BLASTING

Concluding article describes additional quarry characteristics and the blasting procedures which have been found most effective

By BROR NORDBERG

OUR ATTEMPT TO DISCUSS PRACTICES and experiences of the quarrying industry, in the use of millisecond delay blasting, drew an unprecedented response from producers whom we asked to participate in preparation of an article on the subject for publication in the January, 1953, issue of *ROCK PRODUCTS*.

In that issue we attempted to generalize to some extent as an introduction to the subject but we found it necessary to treat each quarry operation separately in order that readers could tie methods to the individual quarry characteristics. Accordingly, we labelled each quarry by number to help identification in the event readers should seek further details about a specific operation.

Seventeen operations were discussed in the January issue, but the 13 pages allotted by no means exhausted the subject and we found it necessary to publish the article in two parts. Herein we discuss practices in a number of additional quarries. For those interested in the overall subject, it is suggested that the articles in both issues be considered and read as one lengthy dissertation on the subject. We repeat herein that technical experts first be consulted before any attempt be made to apply methods of blasting discussed, to any other operation in the interests of safety.

Methods and results are as follows, for the following quarries:

Trap Rock—(18)

A very complete description of experiences in this Canadian quarry was described, as follows:

"Deposit characteristics influencing blasting methods at our trap rock quarry are the uneven surface and the toughness of the rock. The uneven surface makes it extremely difficult and impracticable at present to use any self-propelled drilling rig. For the past two seasons we have used gas-powered diamond drills mounted on skids and drilling 2-in. diameter holes on the lower and relatively flat sections of our deposit. The higher knobby sections are drilled exclusively with air-powered diamond drills mounted on pin bars, and drilling all ½-in. diameter holes. The larger diameter hole is the more desirable as there is less danger of cut-offs with them and loading is much easier and faster.

A trial run using a large head on the air machines to drill a 2-in. hole was made this spring but was found uneconomical as our air supply does not have the extra capacity to drive the machine efficiently.

"The toughness of the rock, along with its hardness, have been the deciding factors in our staying with diamond drills as the primary drilling unit. We are experimenting at present with other drilling methods and have hopes of eventually doing all our primary drilling with a percussion type machine.

"Height of face varies from 60 to 110 ft. and has been up to 120 ft. this year. We are now working on the declining side of a hill and the average elevation of the face is consequently diminishing. The general topography is a series of hills and ridges and the face parallels the general strike of these.

"The 2-in. holes are spaced 12 ft. apart on 7-ft. burden and the 1½-in. holes are spaced 9 ft. apart on 7-ft. burden. Two rows of holes are fired per shot and we would like to use only one but scheduling of drilling and the shortness of the face make two lines the minimum practicable number of lines that can be fired per shot. We have fired up to eight rows per shot but have now settled on two as the toe problem becomes more severe with increasing lines in this type of rock. Cut-offs became more numerous which aggravated the toe condition also.

"Best results have been obtained when a cut, the complete length of the face, has been made. The face is about 500 ft. long and the number of holes varies depending on how many holes on 12-ft. centers versus those on 9-ft. centers are used. Unfortunately toe conditions and the rate of removal of broken rock from the quarry more often than not forces us to shoot the face in two separate sections. We usually shoot two rows of 25 to 30 holes each in each section. Where the two sections join we invariably have to contend with overbreak and shattered ground which makes for poor drilling and loading.

"We have been using C.I.L. short period delay action electric blasting caps with period intervals of 0 to 10 inclusive. The shorter interval of the 0's to 5's, we find, gives slightly better breakage than the 6 to 10's. Over-

all breakage is vastly superior when detonation is with short interval caps compared to breakage when all holes were fired simultaneously.

"Electric blasting caps are used and fired by an electric blasting switch located in a permanent position removed from the quarry. Voltage used is 220. No more than 25 caps are included in any one series and generally a series consists of between 15 and 20 caps. All series are balanced. The blasting switch is used for safety reasons and is kept locked at all times.

"Electric caps with 16-ft. leads are used. We would like to cap the holes at the bottom as well as at the top but the small size of the hole does not so permit without the use of a smaller diameter cartridge. It is solely because of the physical limitations of the hole and the cartridge that we do not cap the bottom as well as the top of all holes. When primacord is used the same restrictions exist and all detonating is done at the top. When using primacord all holes detonated by primacord are fired simultaneously.

"Progressive or alternate shooting of holes is carried out when the section of the face being shot is on the short side, because we then find there is less possibility of overbreak in the tight corners. General practice during the past season has been to detonate one line on one period with the two holes at each end of the section being delayed a further period each. Thus, if the line were capped on #0 period the second hole from each end would be capped on #1 period and each end hole would be capped with #2 period. Holes in the second line are capped one period later than the hole directly in front of them in the first line. This method is used at present to minimize cut-offs due to large blocks of ground moving before the adjoining caps are detonated. We are not convinced of this latter possibility however and various firing sequences are still being tried to determine the most practicable.

"To minimize toe we drill all holes four to five feet below grade. Elevations of all holes are established by levelling, a practice we find pays off in efficient drilling and in holding a flat floor in the quarry. Due to the various fracture planes and the general blockiness of the ground the holes occasionally wander off course at depth and invariably result in toes.

BLASTING

To overcome this, three shots were tried where the whole section was undercut by horizontal holes parallel to the face and located directly under the lines of vertical holes. The vertical holes in this case stopped 10 ft. above grade. These shots eliminated toe but the danger of cut-off's due to wandering holes, particularly the horizontal ones, was increased. Also the time required to prepare the section for shooting was too long and this method had to be discontinued. However the feeling persists with us that under-cutting is the most certain way to minimize toe. If it were not for the

excessive height of our face we would toe hole the entire face before each shot. The law does not permit us to do so at present as our face exceeds 60 ft. in elevation. Should we have occasion to open a face at another level, however, we would limit the height to 50 ft. and toe hole the face for each shot.

"The most spectacular difference between simultaneously fired shots and shots using short period delay action caps is the much more uniform muck pile which results when delays are used and the almost non-existence of very large pieces of

muck. Production is thus materially increased due to the almost total elimination of secondary blasting. All secondary breaking is carried out with a 5000-lb. drop ball with 105 North-west shovel equipped with a 40-ft. boom. The powder factor has been established as 0.143 lb. per ton of rock, a substantial improvement over previous methods. A remarkable feature of delay shooting is the lack of vibration and noise. Backbreak is practically non-existent and throw can be controlled within remarkable limits. Flying rock is a thing of the past with us. Savings in costs have



Progress of a 10-hole shot in a Pennsylvania cement quarry having a 130-ft. face. Rockmaster 1 and 2 caps were used in alternate holes, and charges were detonated from the bottom

BLASTING

not been totally established but our secondary breaking costs have been reduced by 65 percent since the inception of delay shooting.

"We do not use deck charges but load solidly to the collar of all holes. A 75 percent Giant gelatin is used in the lower 30 ft. of all vertical holes and 60 percent Giant gelatin to the collar. The horizontal holes which were used in the experiments on under-cutting the face from a short tunnel were capped with delay action caps and periods used which coincided with the periods of the caps in the vertical holes above. In this particular case it is evident that all vertical holes in each line had to be of one period.

"During the past season we have had one misfire and the cause of this has not yet been completely established. Short period delay action caps were used and eight holes did not detonate. The failure however was electrical and we have not had any trouble of a similar nature since. The timing switch is not used but when primacord was first used a minor misfire occurred when two caps were used to detonate one primacord circuit. The second cap was hooked into the primacord circuit in the center instead of at the end. Only the primacord section between the two caps detonated. Since then all capping of primacord circuits is done at the extremities of the main primacord line.

"As a precautionary practice the main blasting power line from the blasting switch to a disconnect permanently located in the quarry is checked for voltage and current before capping is started. Once capping is underway each series is checked with a galvanometer and when completed is short-circuited. When all series have been shorted the main line is checked, first, for no voltage with a voltmeter, and then with a galvanometer to verify that it is short-circuited at the disconnect ahead of the blasting switch. The various series are then hooked up to the main line. Everybody is then cleared from the face and the final check is made when the main line is hooked in at the disconnect switch ahead of the blasting switch. The last act before firing is to place the fuses in the disconnect and open the main line onto the blasting switch. Firing is then effected by unlocking and throwing the blasting switch."

The four following quarries are all operated by a leading cement manufacturer so there is some similarity as to choice of basic method. However, all the quarries have differing problems, being located in different parts of the country.

Formation with Three Distinct Strata—(19)

The manufacturer describes practice as follows:

"The rock formation of our quarry

comprises three distinct strata of stone sloping from west to east. Quarry development is to the south. On the west side is New Scotland stone of an average thickness of 70 ft. to 75 ft., on top of which is the high lime seam of Becraft limestone averaging 40 ft. to 45 ft. in thickness. This latter seam runs down to the center of the quarry to floor level. In the east section is Port Ewen stone (overlying the Becraft) which starts in the center of the quarry and slopes eastward to floor level. This stratum is 23 ft. to 30 ft. thick. All three formations are of hard, tough rock with the Becraft stone being the easiest to drill. The quarry working face has a height of about 18 ft. on the east side to approximately 100 ft. at the extreme west end. Working face length is roughly 2300 ft.

"Hole spacing varies in each section and is governed by the size of bit used. With a 9 in. drill bit, spacing is 27 x 33 ft. in Becraft stone; 26 x 30 ft. in Port Ewen stone; and 25 x 30 ft. in New Scotland stone. All of our primary blasts are laid out for single row firing. When blasting 6-in. diameter holes (where low face height exists) blasts will consist of from 20 to 30 holes. On the higher quarry faces where 9-in. holes are shot, 12 to 16 hole blasts are made. Two primacords are used in every hole with two electric caps taped on primacord outside the hole. Cap wires are connected to a multiple-wire cable that is in turn connected to the millisecond time switch using a 20-millisecond delay between each hole. Caps are not used in the hole as we drop our dynamite in the hole when we can, and due to our blocky loose formation, we have chokes which we must free with tamping pole and Geosco loading poles. We feel it is not safe practice to have caps in the holes, plus the possibility of a misfire that the shovels would have to dig out. We feel it would be much safer to clean out a misfired hole with primacord than it would be to have caps in the hole. Progressive shooting has given satisfactory fragmentation. Very little toe is encountered when we drill from 5 to 7 ft. below quarry floor level and have all previous stone removed from in front of the blast. Increased production in shovel loading is realized when good fragmentation is obtained; also this reflects in increased rates at the crusher. Deck charges are used only when seams or pockets are encountered in well drill holes. Block-hole drilling and blasting have been minimized by good fragmentation from the millisecond delay time switch. No difficulties from either misfires or cut-offs have been experienced.

"Premature blasting is avoided by placing electric caps on the primacord at the very last minute after all other operations are completed. No connecting or loading is ever done during or at the approach of an elec-

tric storm. If the sky is cloudy and there is a possibility of a storm, static electricity is tested by the use of a car radio. If static is heard on the radio, all operations are immediately stopped when loading a primary blast. Past seismograph tests are not on record, but it is known they have proven the delay time switch has cut down vibration."

Limestone with Mud Seams—(20)

At the second plant of this company, an 80-ft. face is worked, setting off seven primary blast holes with 30-ft. spacing and 25-ft. burden per shot. Optimum delay period is 15 milliseconds on the timer used and about 15-17 on MS primacord connectors. Primacord and switch are preferred for safety, with two MS connectors used between each hole. Progressive shooting is preferred, and practice is to drill 4 ft. below the quarry floor and use No. 2 Nitramex powder to minimize toes.

As far as fragmentation is concerned, it is good where there is a solid wall but uncertain where there are mud slips. Vibration is dampened, and back breakage and control of throw are about the same. Savings in costs cannot be determined. MS connectors are used principally for ease in hook-up, requiring 15 minutes for a 7-hole shot. Timers are considered too complicated, requiring more than an hour for hook-up. This time saving is considered important when electrical storms approach while loading holes.

Misfires are unusual. One hole misfired, with use of the timing switch, in 1951. This was attributed to a mud slip on the far end of the shot. As a safeguard against premature blasting, three switches on the incoming line are locked out until the shot is connected and all men are clear. Shunts are left on the contactor until the last connections are made. Nitramon is stacked in small safe piles until needed. Nitramon is lowered into the holes and not dropped.

At a third quarry of this company, 24- x 25-ft. spacing, single row, is used to fire from four to 12 holes on a 50-ft. face. The optimum period used is 15 milliseconds, using primacord and switch, with progressive pattern and delays between holes. Drilling is carried to 3 ft. below the quarry floor. Quantity of explosives used is 25 percent less than with instantaneous blasting, and there is less vibration, less backbreak and better control of throw. No difficulties have been experienced with misfires or cut-offs.

Porous Limestone with Clay Seams—(21)

This quarry is within city limits and height of face varies from 25 to 40 ft. Spacing is 14 x 14 ft., double row, and as many holes are fired as

can be loaded in a day. Primacord MS connectors and switch are used, the only electric cap being between the battery and primacord trunk line. Delays are between pairs of holes and progressive shooting is preferred. Drilling is carried 2 to 3 ft. below grade and there is no trouble with toes. Powder factor is the same and breakage is considered very good.

Practice is to shoot against a buffer. Vibration is so much less that 40 holes may be fired without complaints, whereas 10 holes was the most that could be fired before with instantaneous shooting. Backbreak is decidedly improved. Benefits, in costs, are not in savings of powder but in time saved through reduction of secondary drilling and less end hole losses.

Stemming is used in primary holes and cut-offs have been experienced with primacord, timing switch and fast delay caps. Experience with MS connectors has been limited, but better results and fewer cut-offs than with previous methods are expected.

Argillaceous Limestone—(22)

This fourth quarry of the cement company is of so-called "cement rock," being a limestone of slaty structure, with bedding planes from fine to massive and dipping 25 deg. to the northeast. Blasting is comparatively easy but better fragmentation is obtained when blasts are at a 90-deg. angle to the strike.

Average height of face is 40 ft. and holes are spaced 17½ ft. apart with 20-ft. burden. Fifteen holes are considered optimum for a blast and they are fired in sequence, in a single row. Optimum delay period between each hole is 20 milliseconds. Primacord is used in the holes with electric caps attached at the surface. Delay caps are not used with the primacord. Two primers are used together with two separate primacord lines in each hole. Two caps are secured to the end of the primacord and taped together, then connected in series, one wire leading to the main trunk wire and the other wire to the timer post.

Drill holes are 6¼-in. diameter, carried 5 ft. below the floor, which practically eliminates toes. As to results, production has been increased because there are no delays in loading caused by secondary blasting. Powder factor has remained the same, but vibration has been materially reduced, backbreak is less and it is easy to hold the blasted stone in close confines. Direct and indirect savings in costs amount to ten percent when compared to instantaneous blasting. Safety provisions are summarized in the following:

"We have very occasional difficulty from misfires, probably not more than one per year. We have been unable to determine just what the cause has been. In some cases it has been trouble with the primer as the primacord was found to be completely detonated.



A shot in a trap rock quarry, using 10,000 lb. of explosive in three holes. Face is 185 ft. high

Several trials were made with fast delay caps instead of the timing switch and misfires occurred; as a consequence we resumed the use of the timing switch.

"Nitramon with two primers and primacord are used in each hole. As soon as the hole is loaded it is immediately stemmed. The end of the electric trunk line circuit is run from the timer behind the adjoining holes to the No. 1 hole and all the lead lines beginning with No. 1 are run from the timer to that hole and repeated with the other holes. They are not immediately connected. All lines are checked with a galvanometer before connecting. No. 6 electric blasting caps are used on each hole. Rubber blocks holding two No. 6 caps are brought to the holes, and after the shunts have been removed, the leads from the caps are tested with a galvanometer. One wire is attached to the No. 1 wire leading from the timer and immediately taped. The other wire is checked with a galvanometer, attached to the trunk line and immediately taped. This operation is repeated until all the holes are capped. The No. 1 cap is taken from the rubber block and placed on the primacord of the No. 1 hole and they are then immediately taped together. This method is repeated throughout the remaining number of holes. The blast is now connected. The lead wire is run from the power switch to the timer and after the lead wires are checked, they are connected to the timer. After making certain that everything is clear the blasting signal whistle is blown and when it again has been checked to see that everything is clear, the lead wires are attached to the switch, the switch is then unlocked by the blaster, the "all clear" signal is given on the whistle and the blast fired. By using this method of taping each connection before it is

dropped from the hand and connected to the primacord, we feel that protection has been secured against any stray current."

Dolomite Rock with Spongy Top Layer—(23)

A 20-ft. face is being worked at this quarry, where from 25 to 50 holes are shot per blast. Three rows make up a blast, with 5-ft. burden and 6-ft. spacing, using one delay period (probably 25 milliseconds) between rows. Electric caps are preferred for ease of connection and initiation is at the bottom, which yields better results and fewer cut-offs. Drilling is carried slightly below the floor level.

Production has been increased and secondary breaking is 50 percent reduced. Powder requirement is about the same per hole, there is less backbreak and the muck pile is much better for loading. Over-all savings amount to one-third for powder and drilling. No cut-offs are experienced.

Massive Granite Gneiss—(24)

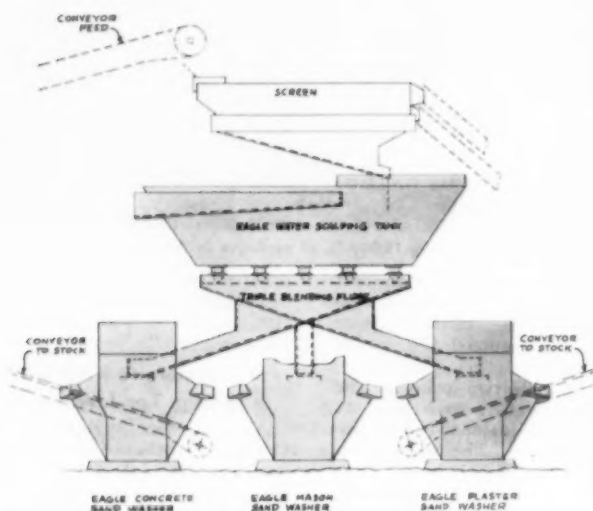
The following is from a producer who has two separate quarries at one location, both of which are discussed separately:

Quarry No. 1:

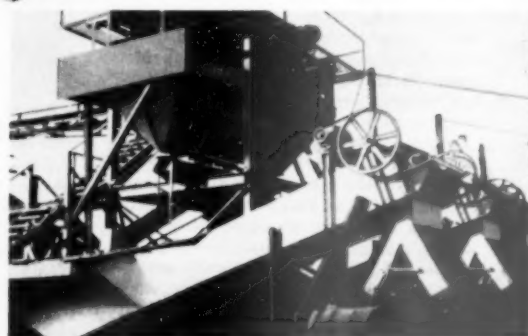
"The rock is massive granite gneiss, which splits away from the face readily but has a strong tendency to break in large blocks. Average height of face is approximately 100 ft. at present. Holes are minimum diameter of 6½ in. for use of 6 in. Nitramon and Nitramex cans. At present these larger holes are all being drilled with a single jet piercing machine. They are carried 5 ft. below the floor. We prefer to shoot 15 or 20 holes at one time when sufficient area on the floor can be cleared for this number. We believe that optimum breakage will be obtained with the delay period of approximately 25 milliseconds but

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No two sand and gravel plants are identical—deposits and methods vary—but, the demand for clean, classified sand is universal. Regardless of your deposit and methods, Eagle equipment can improve your product. Typical applications are shown here—you will find many others in our Catalog 47, sent on request. Ask for a "Questionnaire"—answer the questions, return it and send us a sample from your deposit—Eagle Engineers will give you a report and make recommendations.



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Through use of rotational deflecting spouts and divided dual or triple blending flumes the classified sand from the Eagle Water Scalping Tank can be proportioned or blended—the desired ratio of meshes going to each of two or three Eagle Fine Material Screw Units for washing, further classifying and dehydrating. "System" shown above produces concrete sand, mason sand and plaster sand—each with ideal ratio of meshes.

"System" at left has triple blending flume—classified material from two Eagle Water Scalping Tanks is blended as desired—three blends—each chuted to a separate Eagle Double Screw Fine Material Washer-Classifier-Dehydrator. Unit at left produces mason sand, unit in center produces No. 1 torpedo sand, unit at right No. 2 torpedo. Single screw unit with section of paddles, in right foreground, handles the minus 3/8" — plus 3/16" material. Extra abrading action provided by the paddles gets rid of clay.

This "System", a complete self-contained plant, affords flexibility for changing conditions and changes in demand for a particular product.



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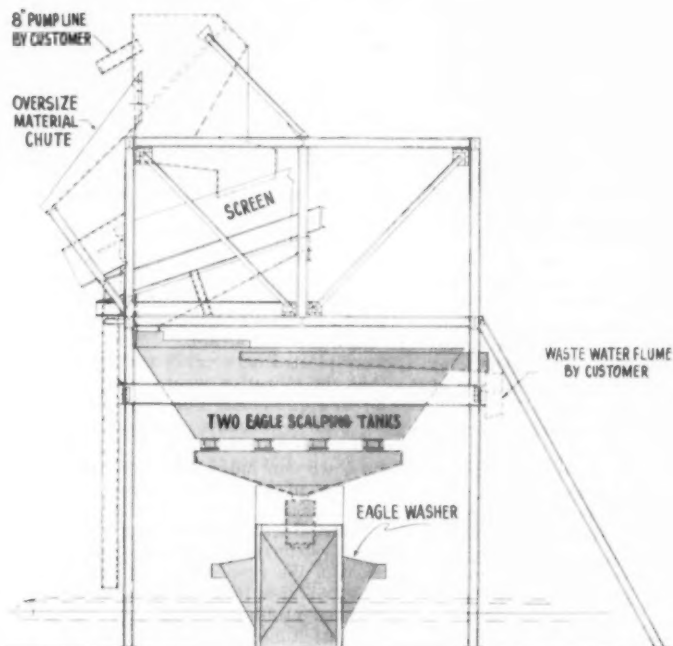
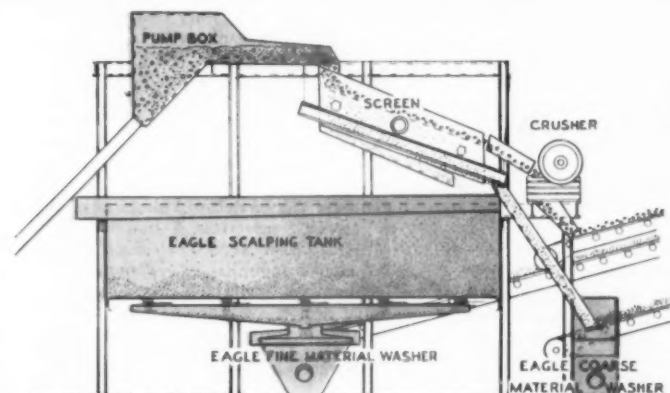
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In high capacity pumping operations a "system" consisting of Eagle Water Scalping Tanks; gathering flumes and double screw fine material units are used advantageously to remove excess water with minimum loss of fines. Gravel is by-passed to conveyor. Concentrated material is then conveyed to additional Scalpers-Screw Washers "System" (not illustrated), for final grading, re-washing, classifying and dehydrating. Concrete sand, mason sand and plaster sand is produced.

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have had to use a shorter delay than this because of very quick movement of the rock after detonation. This quick movement was demonstrated by Bureau of Mines' tests on one of our shots, which showed substantial displacement 30 ft. from the hole in less than 10 milliseconds after that hole was detonated.

"We are using primacord millisecond delays in trunk line connection at present and very much prefer these to the switch formerly used, as they do away with complexity of wiring involved with the switch. These give 17-millisecond delays between successive holes in the single row shot. We prefer progressive shooting, as it allows relief of any tight corner hole and also allows initiation at any hole which has the minimum burden."

"We are initiating detonation at the bottom of holes without use of caps in the hole, as primacord will not detonate the column of Nitramon. The primers attached to primacord are placed near the bottom of the hole and a second primer is placed on top as a safety measure with its own primacord leading out of the hole. This top primer is connected with the trunk line by means of a single interval of primacord delay and thus initiates the hole only if the bottom primer should fail to go. The top primer is insulated from the primacord leading to the bottom primer by means of a strip of a wooden lath taped on. Primacord going to the bottom primer is passed through staples in this lath to be sure that it does not get against the primer can. We think the principal advantage gained from bottom shooting in our case is a considerable lessening in backbreak of the top so that succeeding rows of holes may be better placed. We have had little trouble with toes; but, when this problem does arise, it is handled with wagon drills."

"Because there are so many factors involved, we have never devised a quantitative method of measuring the decrease in secondary breaking but believe from observation and shovel results that millisecond shooting has decreased our secondary breaking approximately 25 percent."

"We try to keep the powder factor the same as when we had instantaneous shooting. Holes are loaded solid column to within 12 to 14 ft. of the top."

"We have had difficulties from misfires in times past, particularly when we were using the switch, and these were thought to be due to very quick and heavy rock movement, which disturbed either the switch, the wiring, or primacord in holes. The possibility of rock movement in loose top layers causing a cut-off of primacord within the hole must still be watched with primacord delay shooting."

"All of our major shots in this quarry are supervised by experts with the explosives company."

Quarry No. 2:

"In the lower level quarry we are carrying a 50-ft. face with wagon drills and using millisecond delay caps in the holes. A shot here will have two rows of vertical holes from the top. These are 25-ft. deep, 7-ft. burden, and 10-ft. spacing. From the floor we drill three rows of horizontal or sloping holes beneath those vertical. The front row of vertical holes is primed with 25-millisecond delay caps, the back row of vertical holes and the top row drilled from the floor with 50-millisecond caps, the middle row from the floor with 75 millisecond, and bottom or toe holes with 100 millisecond."

"This, of course, does not give delay between adjacent holes in any row, but the variation in timing of caps in any one nominal delay seems to contribute to the excellent breakage obtained with this method of shooting. We cannot make any comparison with instantaneous shooting, as this work has always been done with millisecond delay caps."

"Vibration has not been a serious problem with us from either quarry, and delay blasting is used largely for the improved results which it gives."

Faulted Limestone—(25)

This deposit, in eastern Canada, is quarried principally for the production of lime in shaft kilns. It is a highly metamorphosed, high calcium limestone with indistinct bedding dipping at 70 deg. The area is heavily faulted in all directions including many horizontal faults."

Face height is 18 ft. and the spacing of holes is 5 x 5 ft. in a single row. A shot consists of 20 to 30 holes fired progressively by electric caps at intervals of 1/150 second. Electric caps are considered most convenient, and holes are initiated at the bottom to prevent cut-offs. Drilling is carried one foot below the quarry floor."

Millisecond caps have greatly increased production because of reduction of clean-up, and experience has been excellent with respect to vibration, backbreak and control of throw. As to powder factor, it is slightly more than for instantaneous shooting but the slight increase has been effective in almost completely eliminating secondary breaking. The cost of short period delay electric caps is considered expensive and the company is considering using longer holes of larger diameter to reduce the cost."

Hard, Gabbro-Diorite—(26)

An eastern producer provided us with the following detailed information:

"This quarry has been under a hard-ship restriction for many years. We were requested not to shoot over 1200 lb. of explosive at one time, though there is nothing in the law to prevent us from doing so. We operated for many years with one-hole shots,

each containing 1200 lb. of explosive. Of course, this is a very unsatisfactory way to run a quarry."

"About 1946, we became interested in the claims made by the Atlas Powder Co. for reduction in vibration by using their millisecond delay caps. Our first shot was only two holes containing 600 lb. each, with a delay cap on the second hole. A few minutes before, we fired a one-hole shot containing 1200 lb. of powder. Both shots were recorded on the seismograph and the only variable was the delay. Much to our surprise, there was a marked reduction in vibration. We did not fire many more delayed shots until the following year after I had had Lou Miller's (New York Trap Rock Corp.) information on his experiments with the rotating switch. Nobody made delayed action switches at that time so we were forced to build our own. Our switch was different from Mr. Miller's in that his was geared from a synchronous motor to give a uniform delay or .020. Ours was run by direct current and rigged in such a way that we could get any r.p.m. we wanted on the rotating arm. We fired 4-hole shots, varying the delay period from .005 to .039. We recorded the vibration for many such shots and plotted them on a curve. This is how we discovered that the optimum for minimum vibration, at least in our quarry, was around .030 or a little higher."

"We were very satisfied with these results and so standardized on .030. Then we began to increase the number of holes, one at a time, until we had fired 15-hole shots and recorded them on the seismograph. These results were plotted on a curve and we found that the vibration went down sharply up to eight holes. Between eight and 15 holes the curve ran about level and began to rise again at 12. Therefore, we concluded that the optimum number of holes was between eight and 12. Since these experiments were completed four years ago, we have fired, whenever possible, 12-hole shots at .030. We now have very few complaints and do not consider our neighborhood problem serious."

"Our stone is gabbro-diorite. It is a hard, close-grained stone with no seam regularity. Our old face, which is nearly worked out, varied from 60 ft. to 90 ft. high. The second cut is a uniform 50 ft."

"We use 22-ft. spacing and 20-ft. burden on 6-in. well drill holes and 19-ft. spacing and 16-ft. burden on 6-in. Quarrymaster holes."

"We have used millisecond delay caps but do not consider them as effective in reducing vibration as the switch. The switch gives us a uniform delay and we can fire as many holes as we care to. We have detonated holes from the bottom but cannot see any advantage. Therefore, we consider it an unnecessary risk to bury caps in the hole."



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"We have fired about ten shots this year using the primacord millisecond connectors. We have fired shots with one connector between each hole and also with two connectors in series between each hole. These connectors delay about .017 each and we have found that two in series, providing us a delay of .034, give a much better vibration picture. We are not yet ready to standardize on the primacord connectors, but I believe next year we will. I do not believe that you save any money using them, but it does eliminate the complicated wiring job which is quite a hazard.

"We shoot all our holes in sequence and believe that this is the best way for reduction in vibration and maximum fragmentation. We would like to get the answer to the toe problem. We have tried all the kinds of experiments that we could think of and still are dogged by the darn things.

"Delayed action blasting has given us a substantial reduction in the cost of producing stone. The main reason is better fragmentation because we increase shovel and crusher efficiency and reduce maintenance costs all along the line.

"Delayed action blasting requires more powder but we consider that this is the cheapest way to break stone. Our old instantaneous shots gave us about 4½ tons of stone per pound of powder and we are now getting only 3½ tons to the pound.

"Delayed action blasting, when properly executed, will reduce vibration substantially. It eliminates backbreak almost entirely but I do not think the control of the stone on the ground is any better. However, this has never been a problem with us anyway.

"We do not use any deck charges because we use low-grade powder in the upper part of the holes. We do not shoot any block holes because we use the drop ball. I might add here that our drop ball operated hour for hour with the shovel before we used delayed action blasting. Now the ball runs not over two hours per day.

"We have had two misfires since we started using delays. One was caused by the shot having so many holes that strata shifted on the last hole before the electric current arrived at the cap. This is one reason we do not shoot over 12 holes at one time. The other failure was because the switch skipped a contact. This cannot happen again because we wire a cap on to the common lead wire and connect it to the last point on the switch. Therefore, the circuit is broken after the switch makes its first energized rotation.

"We use outside seismograph engineers. During our experimental period we recorded practically every blast that we fired, but in recent years we only check occasionally."



Results of a millisecond delay shot in trap rock quarry, consisting of eight well drill holes with an average depth of 70 ft. with 20-ft. spacing and an average burden of 21 ft.

Lime Plant Quarry—(27)

In this quarry, five 24-ft. benches are worked for a total face of 120 ft. Spacing is 7½ ft. with 5-ft. burden, and sufficient holes are fired to bring down 2000-4000 tons per shot, for loading with a 1½-cu. yd. shovel and feed into a 25- x 40-in. jaw crusher. Spacing is widened to 10 x 7 ft. in producing riprap up to 2000-lb. maximum size for screening over a 5- x 12-ft. scalping screen with 9-in. openings.

Best results are obtained with delays from 0-10, using electric caps with detonation initiated at the bottom of the hole in order to minimize toes. Both progressive and alternate patterns are followed, with progressive on close hole spacing and alternate for wider spacing. It is believed that this practice yields maximum fines, with narrow spacing, and minimum fines with the wider spacing.

Secondary blasting now averages about two boulders per 100 tons of stone loaded and drilling hours for secondary shooting have been reduced 95 percent. Powder factor has not been decreased. By using delays, the shots are well confined within a close area, requiring about 1-hr. bulldozer time per shot to prepare for loading. No misfires have been experienced as a result of using split-second delays. One premature explosion when loading has occurred, for which there is no explanation.

Thinly-Bedded Limestone—(28)

The thin beds in this formation, operated by a cement manufacturer, are easily broken. Maximum height of face is 33 ft. and it is uniform. Primary blast holes are in a single row, spaced at 18 ft. with 14-ft. burden,

and the holes are drilled 3 ft. below the quarry floor.

From 5 to 10 holes are fired per shot, using 14-millisecond short period electric blasting caps, Nos. 0-8, which are attached to primacord in each hole. Holes are loaded in four decks for best fragmentation. The holes are filled to within a foot of the top with fine crushed rock and at this point the blasting cap is attached to the primacord with friction tape. Progressive shooting is followed. Drilling is carried 3 ft. below the quarry floor and toes are rare.

Practically no secondary blasting is required. Powder factor is the same as with instantaneous blasting but there is far less scattering of rock, little vibration and no backbreak. No difficulties have been experienced from misfires and cut-offs. Neither primacord connectors nor timing switch is used. In loading, the lead wires are grounded and the caps are not connected to them until just before the shot is ready to be fired. Then, the lead wires are connected to the blasting machine.

Dense, Heavy-Bedded Dolomite—(29)

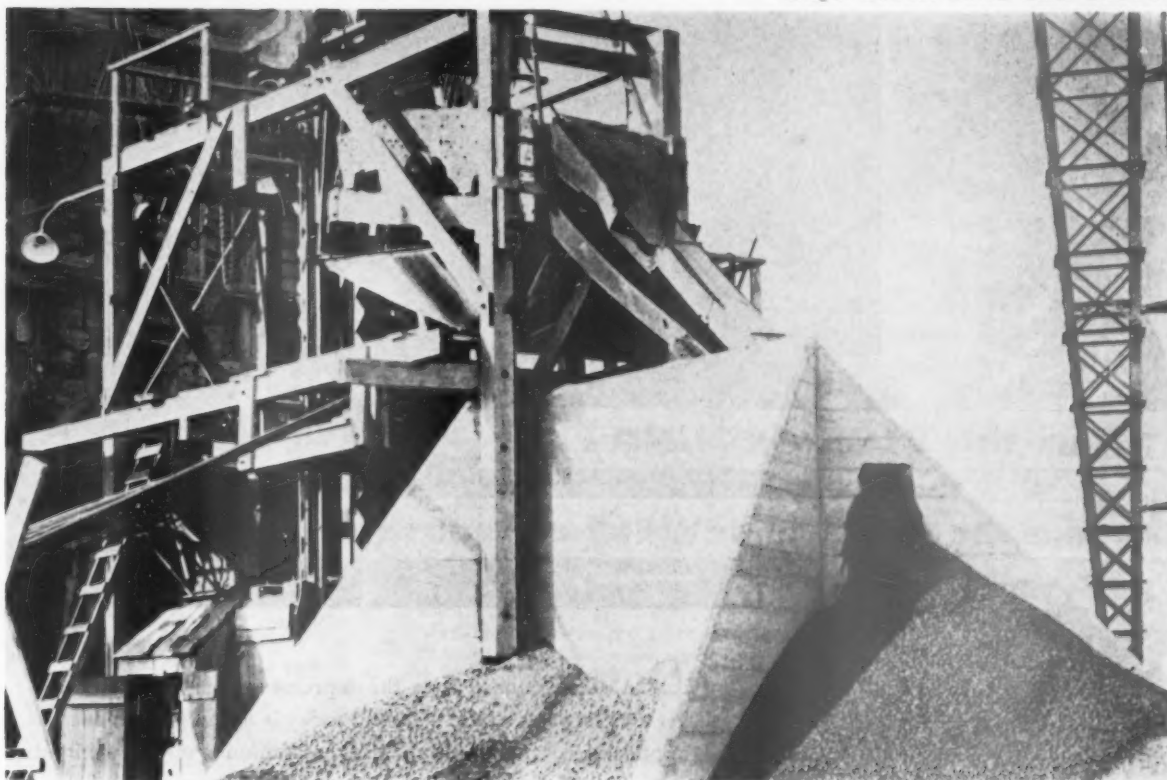
A Canadian lime producer operates this quarry, which has a definite parting at the floor and no toe problem. Height of face varies from 7 to 9 ft. and ten holes are fired per blast with 5- x 5-ft. spacing in a single row. Blasting caps are used with 25-millisecond delay intervals, detonation being initiated half-way down for control of throw. The holes are fired in progression.

Secondary blasting has been reduced 50 percent and production has

(Continued on page 115)

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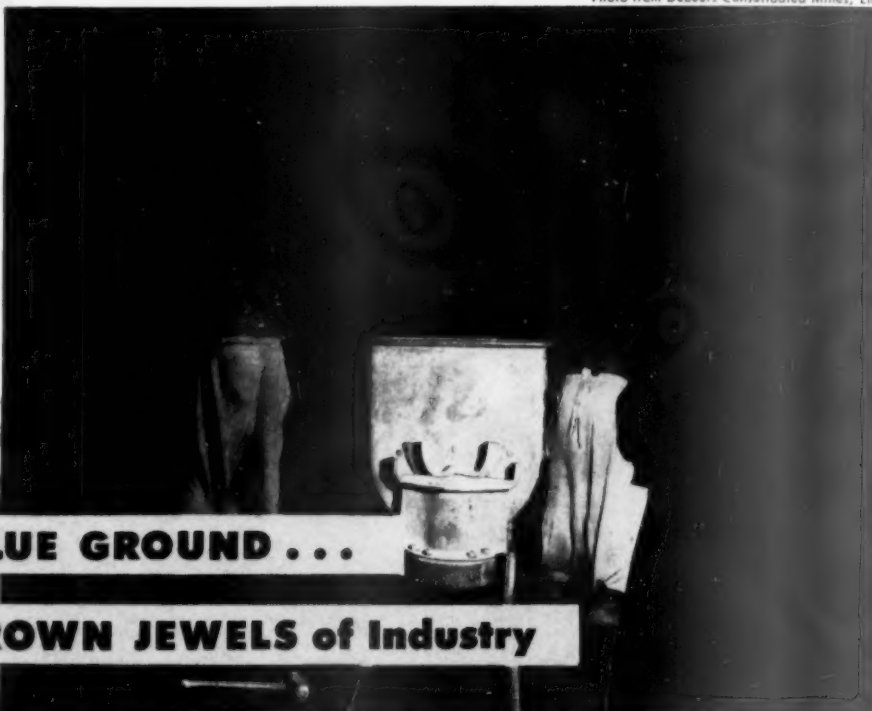
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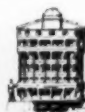
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remained the same. Reduction in powder consumption is 10 percent per ton produced. Vibration was a serious problem, due to closeness to a town, and that problem has been eliminated. There has been no over-all saving in total costs of explosives because of the expense of caps. Fragmentation is much better, which is important because stone must be hand-broken after the blast. There has been no trouble with misfires or cut-offs, and the services of a consulting engineer and seismograph were used once to disprove a damage claim from vibration.

Limestone with Varying Bed Thicknesses—(30)

This quarry is operated by the same concern and presents different conditions. It is high calcium, with bed thicknesses from 2 to 12 in. There are some clay pockets and the floor is very indefinite and rough. Height of face is 12 to 16 ft. Twenty holes are shot per blast in single rows, progressive, with a spacing of 5 ft. 6 in. to 7 ft. both ways. Electric delay caps, of 25-millisecond period, are used and initiation is at the bottom to prevent cut-offs caused by slippage of the beds. Drilling is to 2½ ft. below the floor, and it is often necessary to drill toes with jackhammers and blast after the main shot is cleared away.

Secondary blasting has been decreased by 50 percent and there has been a 10 percent reduction in powder per ton of stone. Throw control and backbreak are much improved. Vibration has been no problem here. No cut-offs have been experienced since changing from initiation part way down, to the bottom of the hole.

Heavily Seamed Bedded Dolomite—(31)

This deposit is in Wisconsin. Practices and experience were described as follows:

"The quarry face averages 66 ft. The rock is thin bedded at the top but the beds increase in thickness up to 8 ft. at the bottom. There are numerous vertical seams occurring in almost every direction. Most of the seams are perpendicular but some are on a slant and some form broken joints or steps with the bed seams. These vertical seams make it extremely difficult to spot well drill holes to best advantage. When the drill holes intercept a slanting seam, the bit tends to follow the slanting seam. Unless special precautions are taken to prevent this, the bit and stem will get stuck or break off or the hole will have to be abandoned. Large rectangular blocks are formed by the seams and it is almost impossible to break them with the primary blast, unless the drill hole passes through or is immediately adjacent to them. The holes are spaced with an average of 15 ft. of burden and 18 ft. between holes.



Alternate millisecond delay blast. There were eleven 6-in. holes in trap rock 65 ft. deep with an average 18-ft. burden and 20-ft. spacing

"Best results have been obtained with shots of approximately 50 holes. There is less end breakage and disruption of stone behind the end cut-off shots per ton of blasted stone. However, the number of holes is not as important as the direction of the vertical seams at the end of the blast. Due to the horizontal seams, it is very easy to have a cut-off, if the delays are too long or the holes are too close together. So far we have had no cut-offs with 17-millisecond delay primacord connectors. Some shots are made with electric caps and some are made with primacord connectors.

"Because of the larger blocks and the greater density of the stone at the bottom, detonation was initiated at the bottom of the hole for a few shots. It was thought that the gases would be confined better, resulting in better breakage. When the large blocks at the bottom are thrown away from the face the thinner slabs in the top get additional breakage due to a longer fall. However we get more cut-offs by this method.

"Primacord is now being used in all holes from bottom to top because of deck loading. Delays between holes produce better fragmentation, less vibration and less backbreakage. With backbreakage, the seams behind the shot are usually opened up. This causes the top layers of the stone to shift, making it very difficult to drill.

"Progressive shooting in a direction perpendicular to the prevailing direction of the vertical seams is preferred; i.e., if the vertical seams are running in an east and west direction and the first shot is north of the first seam, then the shot should proceed in a southerly direction.

"We drill to the depth of the quarry floor. If the holes extend below the floor the gases will follow along a bed seam and cause an upheaval of the floor. There are no toes because the floor is on a bed seam and the stone is broken to the floor depth.

"There is better breakage and production with millisecond delay blast-

ing. The powder factor is not affected. There is less vibration and backbreakage and better control of throw with millisecond delay blasting. Where the quarry floor has a natural parting seam there is the ever present danger of getting a "shove" (part or the entire burden sliding out on the floor away from the face and from 60 to 75 percent of the stone remaining intact).

"Due to the better fragmentation from delay blasting there is less secondary shooting and the stone is processed through the plant faster. More stone passes through the grizzlies and scalping screens, resulting in less work for the crushers.

"We use deck charges, usually three decks, which are connected with primacord. No delay or horizontal holes are used in secondary blasting.

"A few misfires and cut-offs have occurred.

- a.) with primacord, yes.
- b.) none with new primacord connectors.
- c.) one with a timing switch.
- d.) a few with fast delay caps.

"There is no broadcasting station in the immediate vicinity and mobile radio-sending units are not allowed in the blasting area. A seismograph or the services of outside experts are not used."

Solid Dolomite Without Cleavage—(32)

A description of methods and experience in a quarry, very difficult to blast, follows:

"We have used this type of blasting since late in 1945. Our deposit is particularly difficult to shoot as there are no definite lines of cleavage and the rock deposit is rather solid. The height of face is 75 ft. We use a single row of holes spaced 20 ft. apart with 15 ft. of burden. For best results we like to fire 11 holes at one time. The optimum delay period is 225 milliseconds (we assume total interval).

"We use both electric caps and

primacord. The cap is detonated by means of a blasting machine. The reason for using both caps and primacord is to minimize misfires and cut-offs. Also should a misfire occur, we have a means of shooting the hole by connecting a cap to the top of the primacord which is left concealed about a foot from the top of the hole.

"The electric caps are placed in the bottom charge and detonation proceeds from the bottom to the other two charges by means of two separate pieces of primacord. We find that shooting the bottom of the hole first minimizes toe conditions. Even when we use this primacord, delays are used between the different holes up to a total of 10 holes, then we repeat.

"The holes are shot progressively, starting out at one end with a cap which has a delay of about 17 milliseconds. The second hole has a 25-millisecond delay and each additional hole has an interval of 25 milliseconds. This progressive method of shooting gives us good results and no other method has been attempted.

"To minimize toes, we drill 5 ft. below the quarry floor level. This is about 6% percent. We tried drilling about 10 percent below the quarry floor but the toe condition was worse. We use a 6-in. diameter drill bit, but for best results we believe that a larger hole would permit the bottom charge to be concentrated more and result in better shooting, especially regarding toe conditions. We still get some toe and would like to learn how other companies eliminate it.

"This method of shooting has given us more uniform rock breakage. It has increased production since there is less secondary breaking to do. There is a ripping action when delay caps are used which we did not get with instantaneous blasting. Previously we obtained a ratio of 3 to 1 on primary shooting. Now we get a 3½ to 1 ratio.

"Previously, on account of the proximity to the village, we could not

shoot over three holes at one time. Now we obtain less vibration when shooting 11 holes with delay caps because of the tendency for one hole to counteract the vibration of another. We get good clean breakage and the rock is laid down flatter than previously.

"We do not have any actual dollar costs as a result of using delay blasting. There is less secondary drilling, but part of this is due to the mechanization of the quarry as well as to the change in blasting methods. We do not do any horizontal drilling and we do not use delays for block-hole shooting.

"We have no special precautions against premature blasting from extraneous blasting circuits. We keep all electrical circuits away from the blasting area and use a blasting machine for setting off the charge. We have not found it necessary to use a seismograph or the services of outside experts. We have had several cases of cut-offs or misfires, we do not know which, in holes where instantaneous blasting was used, but we have experienced none of these since using the millisecond delay blasting caps."

Stratified Limestone with Hard Top Rock—(33)

This cement plant quarry has strata that vary considerably throughout its length. Some parts are stratified considerably horizontally, but the chief difficulty in blasting is that the top 6 ft. is of very hard and dense stone. Height of face is 28 ft. For fear of complaints from neighbors, shots are limited to 10 holes, spaced 16 ft. apart with 12-ft. burden, which are usually fired in a single row.

Electric caps are used for top detonation, with optimum delay period of 25 milliseconds, and primacord in the holes. A combination of progressive and alternate shooting such as 0-1-2-1-0-1-2-1-0-1-2-1, etc., gives best re-

sults. Drilling is carried 2 ft. below the quarry floor.

Principal benefits are greatly reduced vibration and backbreakage with improved control of throw. Powder factor is about the same. No misfires have occurred and there are fewer cut-offs with delay caps than when instantaneous shooting was used. In hooking-up a shot, the caps are placed last and power is cut off of any nearby cables, as a precaution against premature blasting.

Granite Quarry—(34)

A Virginia producer of crushed granite described his practice and experience in the following:

"Our deposit of stone is a granite formation. It is very hard and secondary drilling is quite a problem with us as it requires so many drill bits. I think perhaps the elimination of secondary drilling was the major factor in influencing us to use millisecond blasting.

"Our quarry face is approximately 100 ft. in height. There is no maximum number of holes to give good results, but a minimum of ten holes gives comparable results to a larger number of holes. We find that the optimum delay period that gives us best results is 20-millisecond delay periods.

"We use primacord and switch mostly. We feel that there is less likelihood of a premature explosion in using primacord. In the summer, there is no danger from lightning, no wires to be broken or worn bare by the explosives going into the bore hole and in the use of primacord, we use a 20 millisecond delay between holes.

"We prefer progressive firing of holes rather than alternate firing of holes. We feel that this method of firing holes has a peeling effect and takes better care of the face than the alternate method of firing does. To minimize high bottom or toe, we drill approximately seven feet below grade and use a lot of care to see that explosives are to the bottom of the hole.

"Millisecond blasting has increased our production by improving breakage of stone so there are not so many delays at the primary crusher. It has also cut considerably our secondary drilling and blasting. Powder factor has not changed a great deal in the primary blasting but has been cut considerably in the secondary blasting.

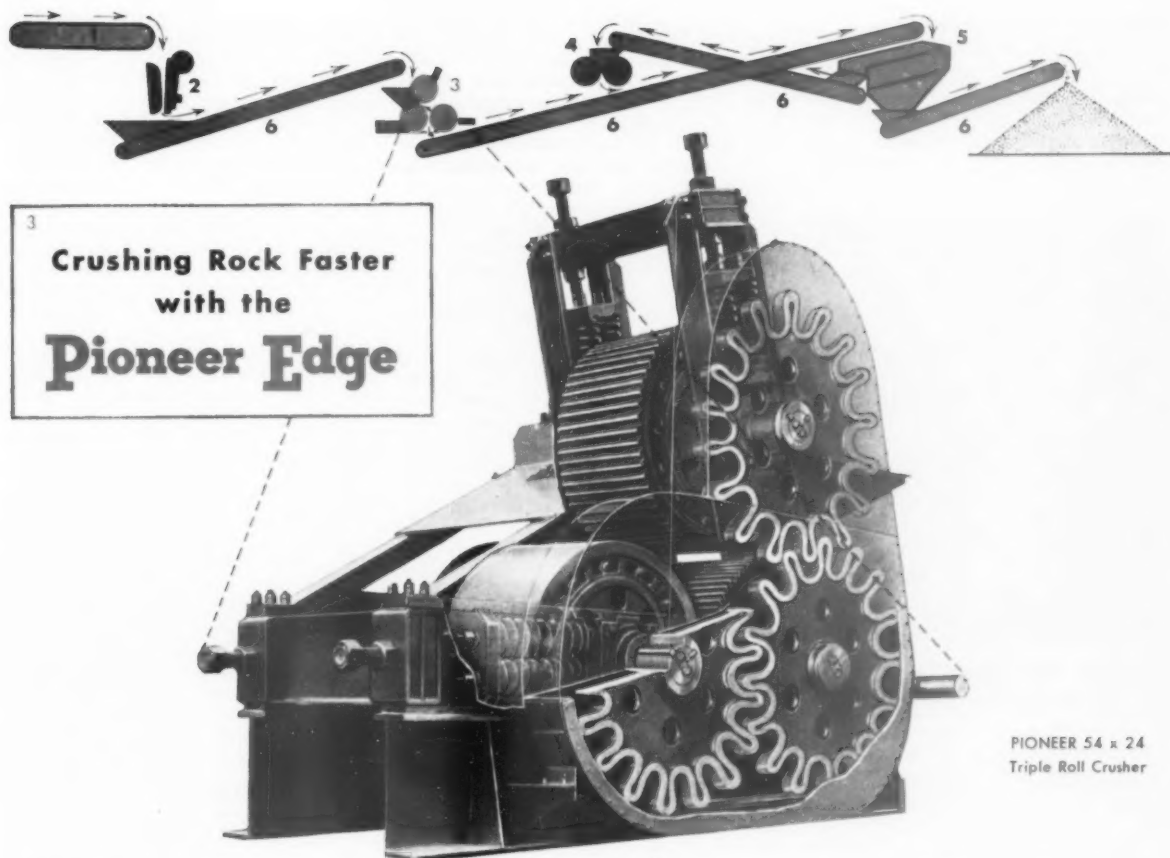
"Vibration and throw have never been a problem with us; however, I would say that both of these have been improved. Backbreakage has shown considerable improvement.

"Saving in cost has been primarily in taking strain off the shovel in the muck pile by having stone better broken. In secondary drilling and blasting this has shown, I would say, quite a saving in the over-all cost of production.

(Continued on page 126)



Shot in a Pennsylvania cement quarry. There were 10 holes and face was 130 ft.



PIONEER 54 x 24
Triple Roll Crusher

6½" reduction...162 tph of 1" minus

Here's a single crusher that does the work of two!

The 54 x 24 Pioneer Triple Roll Crusher reduces 7½" rock to 1" in a single run... because the third roll gives the effect of a second crusher in the circuit.

This lets you open up the primary crusher... and that's when the output of your plant shoots up.

Triple Roll Crushers, manufactured only by Pioneer, come in 3 sizes. Capacity of the big 54 x 24 ranges up to 640 tph, depending on material and size

of product. The smaller 40 x 22 and 30 x 18 also offer the Pioneer Edge in extra performance... pound for pound, hour for hour, dollar for dollar.

FEATURES

1. Star gear drives outwear chains at least 10 to 1... cut costly down-time, maintenance.
2. Less power required per inch of reduction and ton of material... 150 H.P. handles biggest model easily.
3. Widest range of adjustment, pound for pound, of any secondary crusher.
4. Lowest initial cost for any given stage of reduction.

SPECIFICATIONS

PIONEER Triple Roll Crushers	Model 54x24	Model 40x22	Model 30x18
Max. stage of reduction...	6½"	5"	3½"
Max. size of feed.....	9"x9"	7"x7"	5"x5"
Capacity (tph)*.....	32-512	24-287	16-131
Recommended H.P.....	150	125	90
Approximate weight (lbs.)..	51,000	27,000	14,900

Roll drive: Chrome molybdenum star gears sealed in oil.

* May vary ± 25% depending on material and size of product.

Pioneer Engineering Works, Inc., 1515 Central Ave., Minneapolis 13, Minn.
Subsidiary of Poor & Company • Chicago

Please send information on equipment checked.

- | | | |
|--|--|--|
| <input type="checkbox"/> GRAVEL PLANTS | <input type="checkbox"/> WASHING PLANTS | <input type="checkbox"/> MECHANICAL FEEDERS |
| <input type="checkbox"/> ROCK PLANTS | <input type="checkbox"/> BITUMINOUS PLANTS | <input type="checkbox"/> VIBRATING SCREENS |
| <input type="checkbox"/> JAW CRUSHERS | <input type="checkbox"/> APRON FEEDERS | <input type="checkbox"/> BUZZER SCREENS (LIGHT DUTY) |
| <input type="checkbox"/> ROLL CRUSHERS | <input type="checkbox"/> DRG FEEDERS | <input type="checkbox"/> CONTINUOUS CONVEYORS |

Name _____
Company _____
Address _____
City _____ Zone _____ State _____

BUY BOTH!
HIGHER OUTPUT
LOWER UPKEEP

Pioneer

Continuoflo EQUIPMENT

N.A.L.I. Convention

(Continued from page 97)

tons in 1950. The ratio was about the same in 1952, which indicates that there is a substantial threat to the industry represented in the 20 million odd tons sold with ACP assistance, should such assistance be markedly re-



William E. Stone, Piqua Stone Products Div., Armco Steel Corp., Piqua, Ohio, director who led discussion on promotion

duced or dropped by the new Washington administration.

There are other considerations that dictate the necessity for more sales promotion, among them being that exports of farm products are declining, harvests abroad are good, farmers' prices are going down and their buying power will be less in 1953 than in 1952. In addition there is more and more competition for the farmers' dollar.

The question is, as brought out by Mr. Stone, why the farmer is reluctant to buy agricultural limestone himself when it has been shown by demonstrations and in so many other ways that it would pay him handsome profits. The approach to merchandising which emphasizes profits just is not effective in increasing sales in itself and the problem in promoting sales is whether to stress the preservation of fertility for the farmers' children, or pride, or other approach.

Advertising is required in order to educate the farmers, and the balance of the promotion session was based on the various methods that might be used effectively. One approach is through company-employed agronomists and two such experts were called upon for comment. Louis Dushek, Callanan Road Improvement Co., S. Bethlehem, N.Y., touched upon the value of agstone in enhancing the food value of crops, its role in increasing the food value of forage and how it is of benefit for soils of various types in releasing food elements to the plants.

Mr. Dushek stressed the importance of a company becoming thoroughly acquainted with county agents and state agronomists, and he has been very active in establishing that relationship. In his opinion, the industry should develop a working program of promotion in cooperation with the fertilizer industry whereby free publicity and advertising would result covering the use of both commodities, since they must be used together for best results. He concluded by urging that more concerns employ their own agronomists.

William C. Gerhart, agronomist for Fry Coal and Stone Co., Mercersburg, Penn., put on a demonstration of how he operates in his contacts with farmers and he showed and described the testing equipment he uses to advantage. He showed the soil testing indicators and told how he described their operation to farmers before testing their soils, in order that the farmer might interpret his requirements himself as a result of seeing the colors that come up. This impresses the farmer, he said, and usually the farmer's own reading of pH is lower than his own which means increased sales. Also described was a tissue test in use whereby Mr. Gerhart makes tests of plant tissues for farmers which determine the levels of potash, nitrogen and phosphorus in the plants themselves. Thus, his service goes beyond the role of agstone itself in educating the farmer.

Mr. Gerhart believes that personal contact is of utmost importance in the promotion of sales and his company makes good use of literature

to emphasize the value of liming, stresses the timing of application, etc. One outstanding example shown of the type of promotional material used to advantage, was in the form of slides illustrating the work of F. G. Merkle, Pennsylvania State College, showing the effects of use of fine versus coarse agstone and its placement in the soil, on root development and plant growth. In this work, with plants in 9-in. pots, it was shown conclusively that a combination of fertilizer and agstone gave far better results than the use of either by itself, both in leaf growth and in root development.

It was also shown that small amounts of 100-mesh agstone gave far better earlier results than much greater quantities of 10-mesh product. Also shown was the effect of good distribution in the soil. Where the liming was concentrated on one side in a pot, the growth reflected that off-balance and the root system was far more developed in the lime area. Mr. Gerhart said that personal interviews in explaining such educational material are very effective in promoting sales.

Mr. Stone followed this presentation by saying that the fertilizer industry is helping a great deal in selling agstone in Ohio, and that both industries are working together in their literature and other promotional efforts. A 2-day lime and fertilizer school was held this year and the colleges are putting on four district schools. An attempt is being made to get dealers and haulers interested in this educational effort.

Floyd H. Millen, Valley Limestone and Gravel, Inc., Farmington, Iowa, who is president of the Iowa Agricultural Limestone Association, and Clint A. Allen, executive secretary of that association, covered the use of billboard posters in sales promotion. The Iowa Association has pioneered this low-cost method of promotion with effective results and has made the service available to the national organization.

According to Mr. Millen, billboard advertising has provided participating members with 24-hr. advertising at a cost of less than \$1 per day. The standard size of poster is 12 x 25 ft. and they have a white strip below for insertion of the name of the company or trucker. Six different posters are run each year, each being in use for a 2-month period, and they are designed a year in advance in collaboration with the artist of the printing concern. The poster company handles the installation.

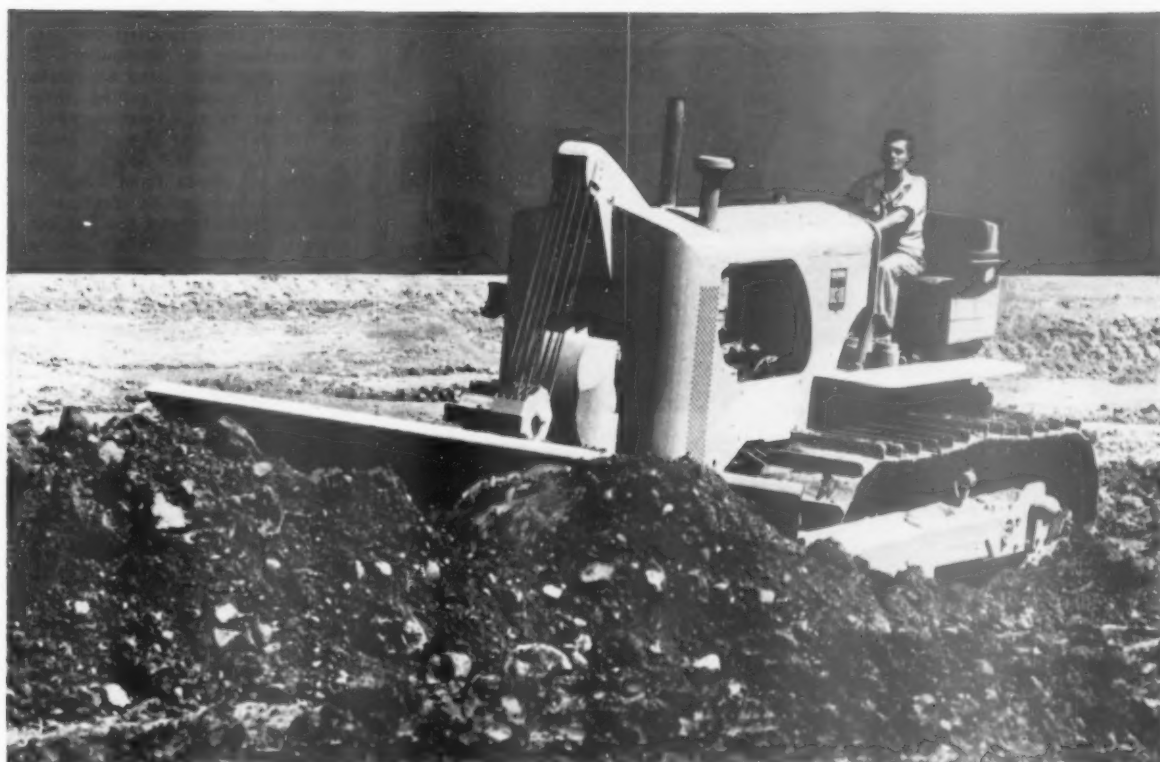
Some of these posters are already in use outside of Iowa. Companies can erect their own boards if they wish in which case the cost is only about \$7½ per month for the poster service. However, the cost of a signboard would be about \$250. Three Iowa producers have their own which permits very strategic placing with respect to their plants. The advantage

(Continued on page 120)



From left to right: Mell A. West, Jr., Burlington Meeker Lime Co., Amity, Ore.; Robert M. Koch, executive secretary; W. S. Black, Black White Limestone Co., Quincy, Ill.; Robert H. Schnepf, Lowden Rock Products Co., Lowden, Iowa

Owners' pride... Operators' delight the **NEW OLIVER "OC-18"**

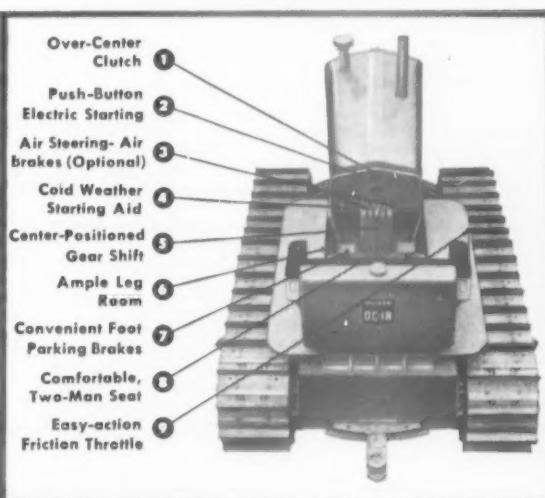


OWNERS can't say enough good things about the new Oliver "OC-18." They keep telling us how it does more work... how that full 133* drawbar horsepower gives it plenty of power for the really tough jobs... about its low operating and maintenance costs... and how the operators and mechanics like it.

OPERATORS are even more enthusiastic. It's the first big tractor they've found that is designed to make life easier for them. They tell us that toward the end of a long day on the "OC-18," they are much less fatigued, much more fit to continue giving top performance. The illustration shows clearly the 9 important "easy operating" features of the "OC-18." No other tractor boasts all these. They make the "OC-18" "the operators' dream come true."

Ask your Oliver Industrial Distributor to arrange a demonstration. Or if you prefer, write to The Oliver Corporation, 400 W. Madison St., Chicago, Illinois.


*OFFICIAL NEBRASKA TEST NO. 489



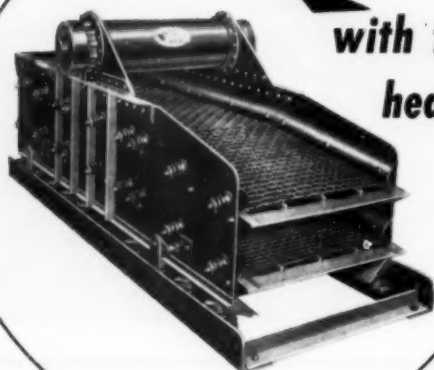
THE OLIVER CORPORATION

400 West Madison Street, Chicago 6, Ill.



A complete line of industrial wheel  and crawler tractors

MORE PRODUCTION... BETTER SAND



with the **NEW DEISTER**
heavy-duty type UHS

Here's why users like it!

1. Life-time unitized vibrating mechanism . . . a precision-built, jig-assembled unit. Two bearing construction. Runs in bath of oil. Renewable sleeves and bearings.

2. Opposed elliptical throw . . . Deister's exclusive powerful throw action controls the movement of material on the screen for greatest speed and efficiency in sizing.

3. Divided screening sections . . . identical in size, may be readily interchanged or shifted to distribute normal wear and prolong life of screening medium. Different size openings may be used with each section, allowing up to 3 sizes on each deck.

4. Sizes . . . 3', 4' and 5' widths; 10', 12' and 14' long and in single, double and triple deck models.

Herbert Sand Company of Milltown, New Jersey, installed one of the first new triple deck 4' x 12' Deister, type UHS, Heavy-Duty Scalping Screens. The screen is producing up to 120 tons of sand and gravel per hour in five sizes in a wet operation—using 2,000 gallons of water per minute. With the new Deister UHS, production has increased substantially and sand quality is better than ever before . . . with a greater percentage of grits for a stronger sand demanded in this highly competitive area.

Mr. Herbert says "The vibrating mechanism is mounted high enough to stay dry during a rugged, wet operation such as ours . . . away from wear and abrasion."

An analysis of your own operation may prove the new Deister UHS will step up your production . . . and quality . . . and profits. Write for Bulletin 54 . . . and a data sheet . . . today.



DEISTER MACHINE COMPANY
FORT WAYNE 4, INDIANA

N.A.L.I. Convention

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of sponsoring a poster program through an association is to get the benefit of low quantity prices, and contracts for six different posters to cover a year guarantee that selected sign boards will be available.

Earl P. Holwadel, Ohio Gravel Co., Cincinnati, Ohio, covered the subject of advertising in newspapers. This company has been doing an outstanding job of creative selling through such advertising. Advertisements are run regularly and the approach is to show farmers the excellent results obtained by others from liming.

The advertisements feature pictures of farmers and the subject of interest together with his comments on liming and its benefits. High-quality professional photographs are used and photographs are later sent to the farmer involved. The company does not as a rule even know the farmer who is featured, but experience has been that they all seem to want to get into the act. The company has had advice from leading newspapers in working out the program. An article by Mr. Holwadel in *Rock Products*, April, 1951, p. 113, gives more details of this program of proof.

Radio advertising was briefly discussed, this form of advertising and direct mail being used about equally but not as frequently as newspaper advertising. Favored radio broadcasts seem to be in the early morning hours, usually for a 15-minute period, and weather reports and farm facts are usually featured.

Mr. Stone covered the subject of direct mail. The association is now preparing 48 news releases per month and has 3000 newspapers on its mailing list. These releases are available at a small charge to producer members. Some 117,000 copies of direct mail were mailed out of the Washington office this past year. Mr. Stone discussed the various leaflets and other releases individually, appraised their value, and listed the inventory of each as now available.

Discussion following these presentations developed many ideas. One producer who feels he cannot afford hiring special field representatives, believes it essential to work more closely with state agronomists, county agents and the fertilizer people—that the approach must be to fully exploit state-paid "salesmen". Demonstrations, tests and dollar appeals to the farmers are not doing the job. A few producers said that farmers in their areas have the idea that over-liming is a hazard and, in one case, some publicity put out by the local college gave the farmers the idea that liming requirements have been completely fulfilled in that area. Yet, in that case, it has been proved that 8 of 10 farms need liming.

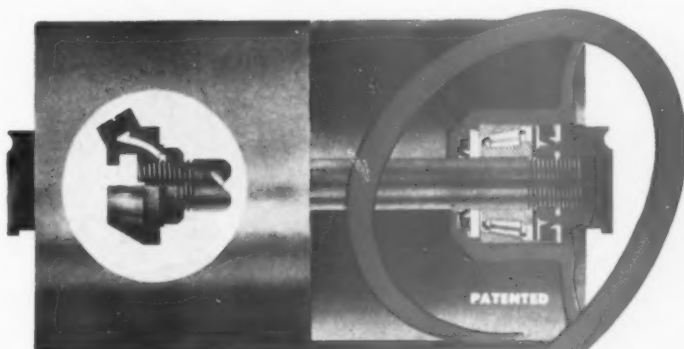
Another point brought out was that more attention be given to spreading

(Continued on page 123)

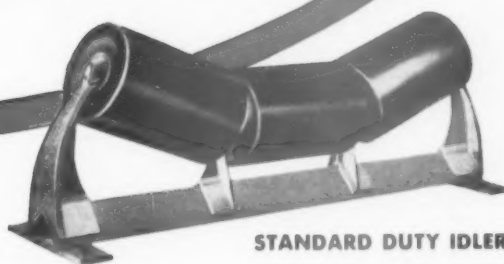
NEW **UST*** Continental Idlers

* UNIT-SEALED PRE-LUBRICATED TIMKEN BEARINGS

Saves Grease!
Saves Labor!
Saves Belts!



CGC UNIT-SEALED
CGC PRE-LUBRICATED
CGC TIMKEN BEARINGS



STANDARD DUTY IDLER

Continental's Unit-Sealed "UST" Conveyor Idlers, incorporating Timken Bearings, Garlock Klosures, are the answer to the operator's prayer.

The Unit Bearing Assemblies—"sealed unto themselves" provide an ample but not excessive grease reservoir. This represents a saving of grease and further eliminates any possible migration of the grease from upper to lower bearings on inclined rolls. The lubricant is a top quality water repellent grease of a stable consistency with a wide temperature range for long life.

Most important—this construction permits operating the Continental "UST" Idler without relubrication for 1-2-3 years depending upon the severity or character of conditions.

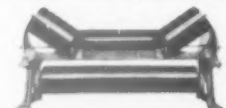
For detailed information on these idlers write for Bulletin R.P.-116



SELF-ALIGNING FLAT BELT IDLER



RUBBER DISC IMPACT IDLER



GRAIN CONCENTRATION IDLER



SELF-ALIGNING TROUGHING IDLER

Long Life- THE ULTIMATE IN MINIMUM MAINTENANCE

CG-5209

INDUSTRIAL DIVISION
CONTINENTAL GIN COMPANY

BIRMINGHAM, ALABAMA

ENGINEERS



ATLANTA • DALLAS • MEMPHIS • NEW YORK



MANUFACTURERS

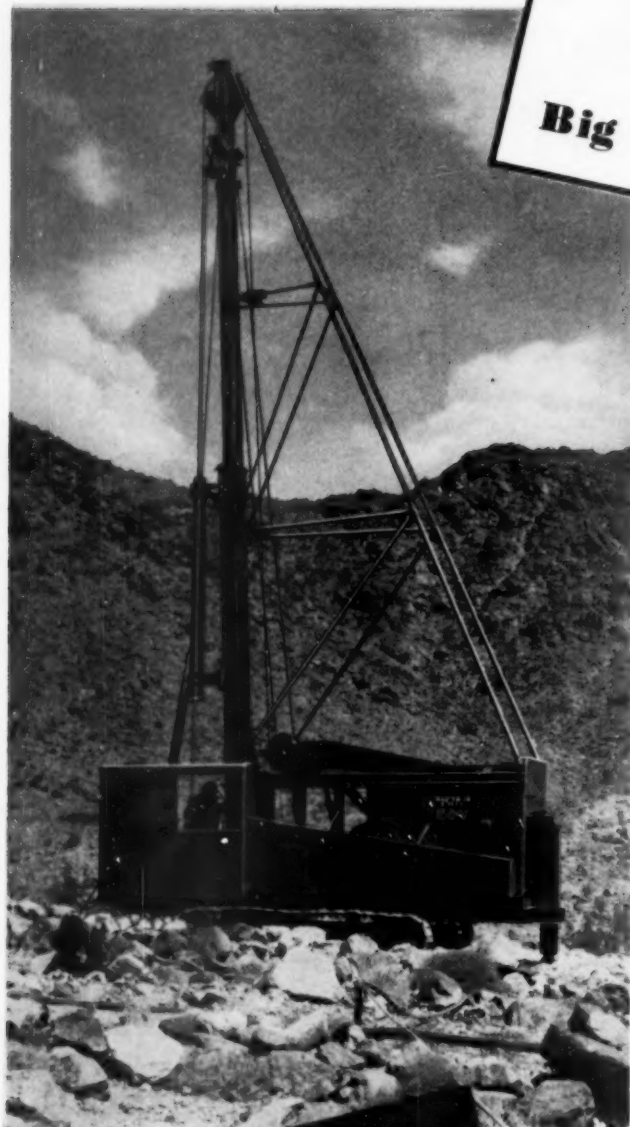
New

BUCYRUS-ERIE



50-T

**Big Time Rig
for
Big Time Operations**



**Handles 6,000 lbs. of tools
Drills 9" to 12" holes**

HERE'S the largest capacity, mobile churn-type blast hole drill on the market today. It's the new Bucyrus-Erie 50-T, successor to the well-known 42-T used and preferred by quarry operators the world over for the past 16 years. The new 50-T gives you all of the popular advantages of its predecessor plus many improvements based on Bucyrus-Erie's unequalled experience in manufacturing blast hole drills. Some features that make the 50-T stand out are:

NEW TUBULAR TYPE TOOL GUIDE steadies and guides the tools when a new hole is started, enabling the operator to run drill at maximum speed from the very start of the drilling operation. Guide opening and closing is hydraulically controlled.

HYDRAULIC LEVELING JACKS two at the drilling end and one at the power unit end, make leveling fast and easy. Jacks are 5½ inches in diameter and have a 36-in. maximum travel. Jack supports are an integral part of the drill frame.

NEW HEAVIER DERRICK MEMBERS to give you all the derrick strength needed to meet toughest drilling conditions. Lower section has 10-in., 15.3 lb. channels; upper section 9-in., 13.4 lb. channels.

POWER DRIVEN TOOL WRENCH, built into the operator's platform, makes easy work of setting up or loosening tool joints. Proper pressure for tightening up tool joints is determined by means of a hydraulic torque indicator. Write for complete information. You'll be convinced that the new, powerful 50-T can make money for you!

1B53C

**BUCYRUS
ERIE**

SOUTH MILWAUKEE
WISCONSIN

N.A.L.I. Convention

(Continued from page 120)

equipment and service so that spreading can be done uniformly in order to obtain best results. It was also emphasized that the trucker is the main contact a company has with the farmer and that good relations must be built with him. Mr. Stone said that his company is very careful in the selection of truckers and that it is mandatory that they have good equipment.

Lime Requirements

William D. Dillon, Dillon Stone Co., Columbus Junction, Iowa, presided for the final convention session which considered lime requirements and the subject of percentage depletion.

"Closing the Gap—Lime Use and Needs" was the subject of a talk by W. A. Minor, assistant to the Secretary of Agriculture. According to Mr. Minor's figures, the nation's farms could use 14 times as much liming material in 1953 as was spread in 1951 just to make up for deficiencies in the soil—the gap being 368 million tons—and 50 million tons annually thereafter.

This lack of sufficient liming is considered a serious threat to our civilization in view of increasing requirements for food by a population that is growing at a rate of 2½ million people a year. The food requirement is expected to be 25 percent greater in 1975 than it was in 1950. In the face of this challenge, there is little good agricultural land to be brought into production, the farm labor force is declining and overall soil fertility is on the downgrade. The only answer, he said, is in greater productivity per acre which requires the use of more liming materials and fertilizers. The objective of the U.S.D.A., is (1) more efficient use of lime and fertilizer, (2) to bring up the productivity of the nation's soils and (3) to accomplish greater returns to the farmers. Mr. Minor stressed the need for "other practices" than liming as essential to conservation practice that will improve farming.

He emphasized that the job can only be accomplished through an all-out educational effort directed by every possible means to the farmer. Part of this education is expected to come through efforts of the land grant colleges, demonstrations are to be encouraged, and soil and plant tests should be widely used. Educational material should be designed for ease in interpretation, he said, and research projects directed at marketing, distribution and methods of placing of agstone. Funds are not available for all these necessary efforts so he plugged for cooperation by producers and equipment dealers. Producers should direct educational efforts to their dealers and distributors as part of an overall program to get

(Continued on page 150)

American HAMMERMILLS

OFFER...



"ACS Series"
Made in 4 sizes
and two types.
Capacity to 250
T. P. H.

Front Feed — For
minimum of fines.
Center Feed — For
maximum of fines.
(Illustrated at left)

...A Size for Every Tonnage

"30 Series"
Made in 4 sizes.
Capacity up to
100 T.P.H.



...from Roadstone to Agstone



"24 Series"
Made in 4 sizes.
Capacity up to
50 T. P. H.

Write for Bulletin—"Better Stone Crushing"

American

PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1245 Macklind Ave.

St. Louis 10, Mo.

YUBA PLACER DREDGE DIGS, TREATS, STACKS 18,000 TONS GRAVEL DAILY...



While Mining Gold

This placer dredge with 18 cu. ft. buckets digs to 125' below water, averages better than 22 hours running time daily. Intricate treatment equipment on board limits digging to only 18,000 tons of gravel per day. For sand and gravel digging only, an 18 cu. ft. YUBA dredge can produce as much as 40,000 tons daily.

5¢ Per Ton

YUBA gold dredges of this type can be converted readily to produce and size gravel at total operating costs substantially under 5¢ a ton. One big advantage—they float in their own ponds and excavate gravel without lowering surrounding water levels.

Long Operating Life

With YUBA dredges you get both low production costs and long operating life—many YUBA dredges are operating efficiently after 25 years or more of rough service. Consult YUBA NOW. We will design and build a new dredge to fit your ground; or help you find a used dredge, and move, redesign and rebuild it. Wire, write or call us—no obligation, of course.

Profusely illustrated, 40-page brochure,
"YUBA Dredges," yours for the asking.



YUBA MANUFACTURING CO.

Room 717, 351 California St., San Francisco 4, California, U. S. A.

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MANUFACTURERS NEWS

Cummins Engine Co., Inc., Columbus, Ind., has announced the appointment of C. R. Boll, Jr., as general sales manager of engine, parts and contract sales, the company regional organization, advertising and sales development. He was formerly manager of engine sales. Mr. Boll joined the company in 1941 as a sales engineer



C. R. Boll, Jr.

following his graduation from Purdue University. During World War II, he served as an officer in the Signal Corps, and in 1945 and 1946 was a staff officer in Gen. MacArthur's headquarters in Manila and Tokyo. Upon his return from service, he rejoined the company, and in May, 1947, was promoted to assistant regional manager, Great Lakes Region, Cleveland, Ohio. He held this position until his appointment as manager of engine sales in 1948.

Chain Belt Co., Milwaukee, Wis., has appointed Parker Eddy as district sales manager of the Los Angeles office of the construction machinery division. John Heinrich has been named district sales manager of the Kansas City office. Roy L. Peck has joined the division as truck mixer specialist, with headquarters at the Milwaukee plant. Frank Peddar, who has been with the Rex construction machinery division for 25 years, has been appointed special sales engineer for Rex dewatering pumps.

R. G. LeTourneau, Inc., Peoria, Ill., has announced the appointment of Harry R. Powers as domestic sales manager. He was formerly Eastern area sales manager and succeeds R. P. Nichols who has joined Ryan Equipment Co., St. Louis, Mo., LeTourneau distributor.

Fruehauf Trailer Co., Detroit, Mich., announces that Robert F. Costello, sales manager of the Chicago branch, has been assigned to the Fruehauf Trailer Co., Sao Paulo, Brazil, to assist in setting up the Brazilian sales organization.

Clark Equipment Co., Battle Creek, Mich., announces the appointment of A. O. Williams as director of engineering, industrial truck division, where he is engaged in new product research.

C. S. Johnson Co., Champaign, Ill., has appointed W. C. Caye & Co., Inc., Atlanta, Ga., to succeed the Decatur Truck & Equipment Co. as distributor for the state of Georgia with the exception of 24 southeastern counties.

It Takes All Kinds... and Bemis Makes 'Em

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Sewn Valve

Bemis makes all four of the basic types of multiwall paper bags. When you add the almost limitless variations to meet special requirements... AND the Bemis engineering know-how to create still new bag capabilities... AND the twelve Bemis Multiwall Plants, strategically located coast-to-coast to give you top service... You have your best multiwall source...

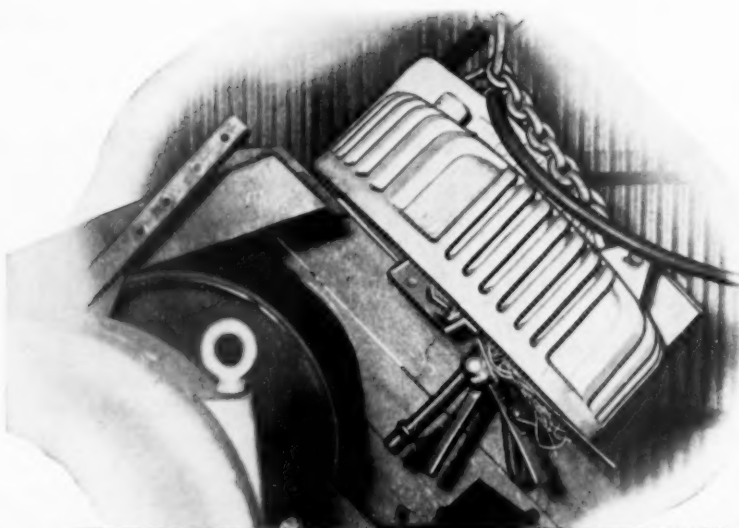
Pasted Open Mouth

Pasted Valve

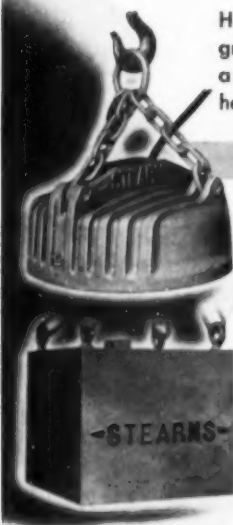
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REMOVE TRAMP IRON *Before* DAMAGE Starts!



Here is the positive, economical way to protect crushers, grinders, pulverizers and other vital equipment — use a STEARNS Suspended Magnet over your conveyor or head pulley.

CIRCULAR SUSPENDED MAGNETS

Stearns Suspended Separation Magnets are powerful units for removing tramp iron from various kinds of conveyed materials where protection to crushers and other processing machinery is necessary. Eliminating foreign metal means fewer repair bills on crushing equipment, fewer shutdowns and higher production.

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Whether your problem is the fairly simple job of tramp iron removal or the concentration and beneficiation of complex ores, STEARNS has EXPERIENCE ENGINEERED equipment to meet your requirements. Tell us about your problem; complete recommendations without obligation.



Foremost in the Magnetic Field
Stearns MAGNETIC INC.

675 South 28th Street, Milwaukee 46, Wisconsin

Blasting

(Continued from page 116.)

"We do not shoot horizontal holes. All holes are vertical and we do deck load them. This is another reason for loading with primacord as we can put in the amount of stemming required and continue with our loading rather than having to put in a detonator at each deck.

"We have had some difficulty with cut-off holes but no misfires. Out of several hundred holes we have had not more than half a dozen cut off and this was attributed to earth movement cutting the primacord. All of this has been with timing switch.

"One of our special precautions against premature explosions from firing extraneous blasting circuits or any other circuit is the use of primacord and firing from the top of the hole. The last duty performed before firing the blast is to connect the electric blasting cap to primacord, thus eliminating the chance of stray current getting into the shot while the loading is in progress.

"We have never had an occasion to use the seismograph. I think it is conceded a fact in millisecond blasting that the chance of a cut-off hole is greatly increased over instantaneous blasting. However, our experience has not been such as to give us too much concern about cut-off holes."

Hard, Tough Dolomite—(35)

A Wisconsin producer covered the subject as follows:

"We have been using delay caps for the last six years and have learned a few things by a trial and error method.

"Our stone is known as Blue Niagara dolomite and is quite hard and tough. We use wagon drills and 2-in. carbide insert rock bits and drill to depths of 4, 10, 12, 16 and 19 ft. depending upon which ledge we are working.

"We find it advantageous to lay out our blasts in multiple rows, keeping the holes in each row from 5 to 6 ft. apart and also the rows 5 to 6 ft. apart depending on the ledge we are working. Our quarry is located within the city limits and we, therefore, are obliged to keep the number of holes to a minimum. On the 4-ft. depth we shoot up to 40 holes a shot and on the 19-ft. ledge we try to keep in the neighborhood of 12 holes.

"At first we loaded the first row with 25-millisecond delay caps, the second row with 50 millisecond and the third row with 75 milliseconds. Lately we tried to lengthen the delay period between the rows using 25 milliseconds, 75 milliseconds and 125 milliseconds, and find the results very gratifying.

"We had some trouble with toes and solved this by using a longer wire cap and initiating the detonation in the layer which caused the toe. Then we ran into the trouble of having some of the top layers break off in



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there's a B&O coal to fit it!**

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B&O coals are excellent for generating steam in utility and industrial power plants, for steel mills, malleable iron plants, gas plants, lime and brick kilns, cement and glass plants, and potteries.

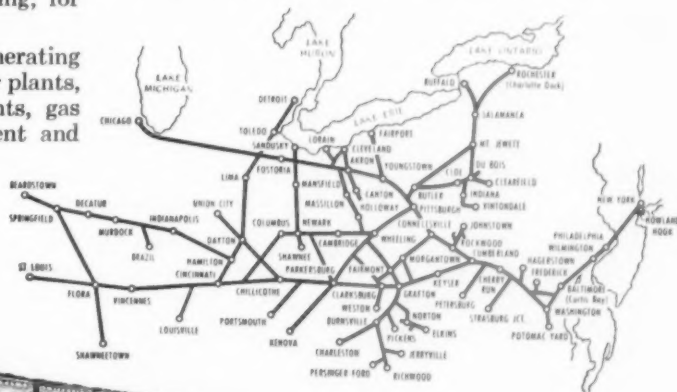
Whatever your "burning need," Industrial or Domestic, there's a B&O coal to meet it—and we are ready to help you find the best for your purpose. Just ask our man!

**BITUMINOUS COALS
FOR EVERY PURPOSE**

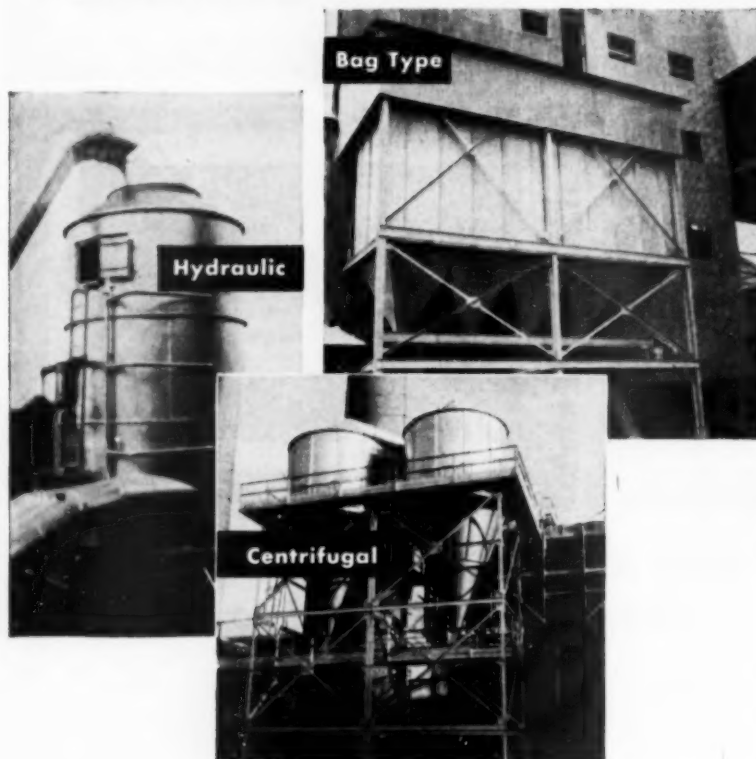


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Dust and fume collection fits into processing and manufacturing in a big way. Norblo has helped to implement this valuable aid to safety, health and economy in a big way with outstanding developments in three principal types of collection — Centrifugal, Hydraulic and Bag systems.

Norblo Systems are making new records for high recovery with low operating and maintenance costs. High-efficiency equipment is engineered to include the correct factors to suit your needs and carries the Norblo guarantee of performance. Get the facts on Norblo Dust and Fume Collectors before you decide on any dust or fume collection equipment.

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large chunks. By alternately initiating the detonation at the bottom of one hole and the top of the next, we have overcome this problem."

Large Capacity, Low-Face Quarry—(36)

Blasting practices and experiences at one of the largest capacity limestone operations in the country are described as follows:

"The particular deposit being quarried is part of the Niagaran series of the Lower Silurian period, yielding a limestone of exceptionally high calcium content. A seam of high calcium stone approximately 60 ft. in thickness is being quarried. Since the beds dip southeasterly approximately 55 ft. to the mile, and the rock surface slopes in a general southerly direction, the high calcium stone is exposed beneath the overburden for some 8000 ft. At the present time, this layer of high-calcium stone is being removed in one lift, with 3 working faces advancing easterly, westerly, and northerly. Working faces vary from 30 to 50 ft. in thickness. The bottom 20 ft. of stone is generally very hard and blocky, approaching dolomite in its drilling and blasting characteristics. The top 30 ft. of stone contains many more parting seams, and is relatively easy to blast.

"The method of blasting is determined largely by the method of loading. Each face is worked with a Bucyrus-Erie 170-B shovel loading directly into rail cars. The loading track is parallel to the face, 75 ft. away. A 45-ft. cut is then blasted so that the throw does not exceed 75 ft. and cover the loading track. The shovel then travels down the length of the face loading a cut 75 ft. wide from the spill pile. The track is then moved over 45 ft., and a second cut is taken, recovering the remainder of the blasted stone. This leaves the track 75 ft. in front of the solid bank, and another 45-ft. blast is made.

"To shoot a 45-ft. cut, 2 rows of 6-in. diameter holes are drilled with 15- to 18-ft. spacing, depending on the height of bank and hardness of the stone. The front row has a burden of 25 ft. and the back row 20 ft. A standard 4 ft. of overdepth is used on all holes. One-half the length of a working face is shot at one time, so that an individual blast contains from 150 to 400 holes. About one-half of the blasts are detonated with primacord, and one-half with millisecond delay electric caps.

"No delay is used on the primacord blasts other than about a 2-millisecond delay between the trunk lines introduced by placing a loop in the back row trunk line between the detonating cap and the first hole. The front row trunk line runs directly from the cap to the first holes, being some 50 ft. shorter than the back row trunk line. The blasting timer has been used on

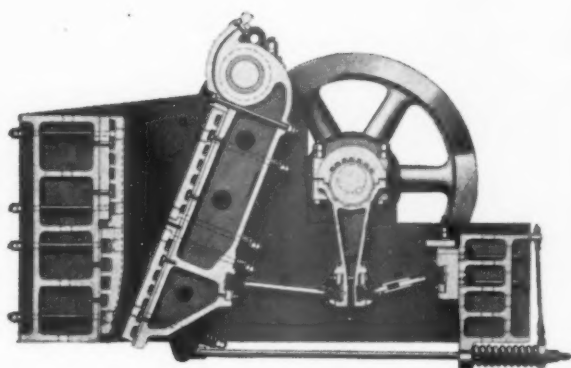
(Continued on page 134)

DRY ROLLING TOGGLES ON A-C JAW CRUSHERS

Last 4 to 6 Times as Long

AS OLD TYPE JAW CRUSHER TOGGLES!

ALLIS-CHALMERS
Jaw Crushers



FROM A ROCK AND SAND PLANT...

Dry toggles installed 2½ years ago still going strong!

FROM A CEMENT PLANT...

After more than 2 years' operation, dry rolling toggles show relatively no wear!

FROM A MINING COMPANY...

New dry rolling toggles last 3 months, operating 24 hours a day. Old toggles lasted only 1 to 3 weeks!

FROM A QUARRY OPERATOR...

Dry rolling toggles installed 2½ years ago show very little wear.

Users names on request.

ACTUAL FIELD REPORTS show Allis-Chalmers dry rolling toggles (which are still in use) have already lasted *up to six times* as long as conventional toggles. No wonder crushing men are enthusiastic!

True rolling action of toggle ends and seats — instead of damaging sliding action — results in much less wear. Friction is eliminated — toggle ends operate cold even after a day's crushing.

Maintenance is less, too. No lubrication is required. Toggle ends operate dry. It's safer and cleaner around the crusher because there are no oil lines, no messy oil drip.

For more facts, get in touch with the Allis-Chalmers representative in your area, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS



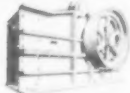
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Jaw Crushers



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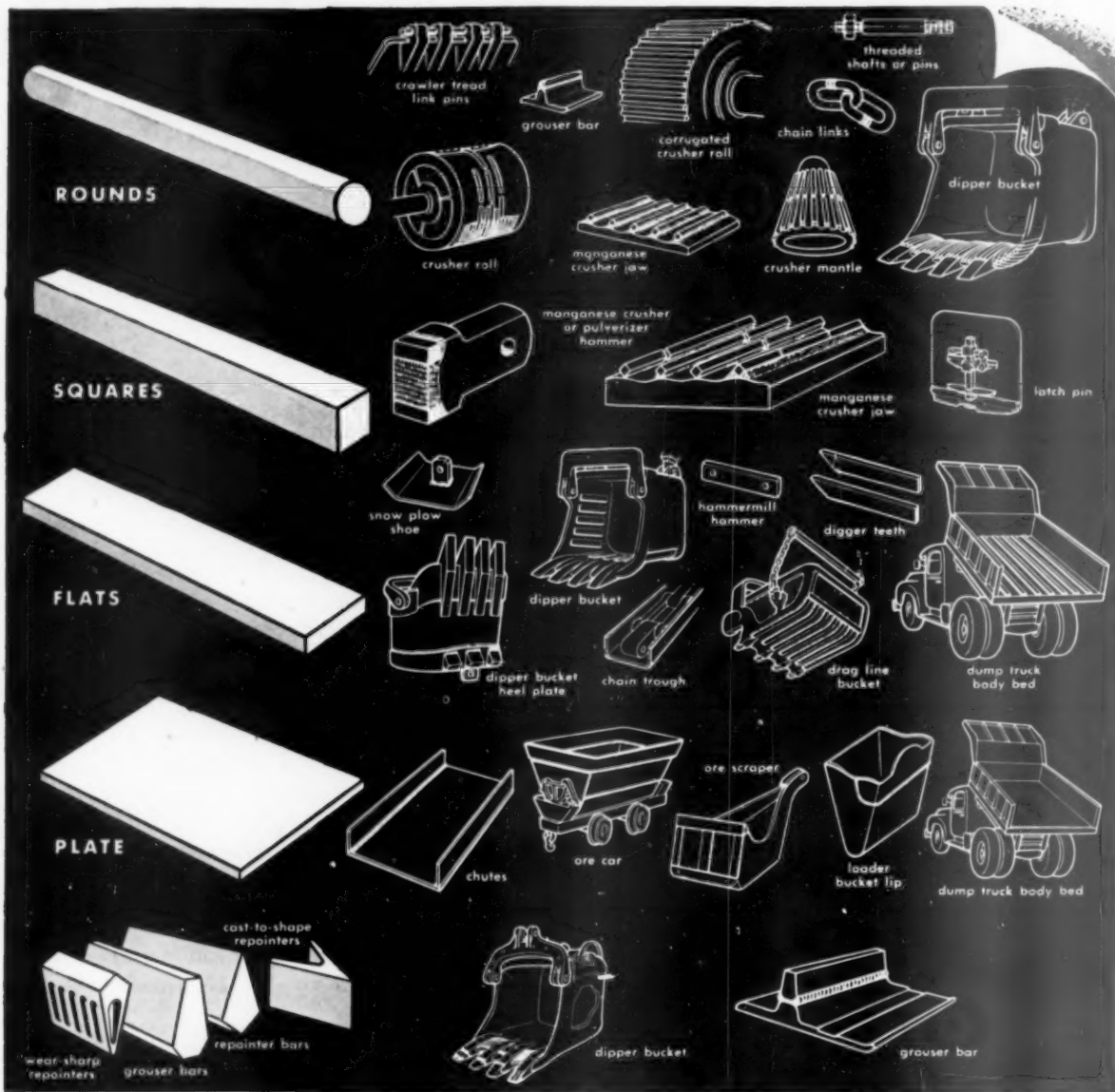
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Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

INFORMATION

You can obtain catalogs listed on these pages by merely checking and mailing the coupon below

TO HELP YOU MEET TODAY'S PROBLEMS AND TO MAKE PLANS FOR TOMORROW

- 1 **AIR-ENTRAINING AGENT**—A. C. Horn Co., Inc., has released a bulletin on Ayr-Trap, its air-entraining agent. Functions, effects and factors affecting the amount of entrained air are described. Bond strength, freezing and thawing resistance and compressive and flexural strength test results are given.
- 2 **ARC WELDERS**—Hobart Brothers Co. has published an 8-page folder illustrating and describing its line of gasoline engine driven arc welders. Electrical and mechanical specifications are given for the arc welders and for the combination model of arc welder and power unit.
- 3 **BALANCE**—Fisher Scientific Co. has released an 8-page booklet which describes its direct-reading, single-pan Gram-atic laboratory balance. Construction features, specifications and accessories are discussed. The entire weighing procedure is illustrated.
- 4 **CARBURETOR**—Pennsylvania Refining Co. has published a 46-page carburetor handbook entitled "Know Your Carburetor." It describes in non-technical language the basic theory of the carburetor, its various parts, and the common carburetor troubles usually encountered and how to correct them.
- 5 **CENTRIFUGAL PUMPS**—Allis-Chalmers Manufacturing Co. has published a new bulletin titled "Handy Guide to Selection of Centrifugal Pumps". Bulletin 52C6059J covers general purpose, double suction, multi-stage, special purpose, marine and mixed and axial flow pumps. It also has a head-capacity table for single stage, double suction pumps.
- 6 **CONCRETE ADDITIVE**—Veriset Corp. has published a bulletin on its product Veriset, a soluble liquid concrete additive. Major advantages, information on how and where to use, compression strength and water reduction test results, and absorption and porosity test results are given.
- 7 **CONVEYOR BELT LACING**—Flexible Steel Lacing Co. has issued Bulletin No. A-70, describing and listing Alligator long-length conveyor belt lacing. It contains application views, sizes and list prices.
- 8 **CONVEYORS**—A. B. Farquhar Co. has issued a sheet announcing the addition of a complete line of gravity roller and wheel conveyors to its present catalog of power-driven conveyors.
- 9 **CRANES**—Gar Wood Industries has issued a catalog describing the Model 75A and 75B shovels and the 75BT truck crane. Construction and operational features are given. A specification chart is also included.
- 10 **CRUSHERS**—Pioneer Engineering Works, Inc., has issued a 16-page catalog, No. 632, on "basic units" for stationary crushing, screening and washing plants. Bulletin explains features and specifications of crushers, feeders, conveyors, vibrating screens, revolving screens, scrubbers, dehydrators, bins and related units. Detail drawings cover stationary primary units.
- 11 **DAMPERS**—Minneapolis-Honeywell Regulator Co., Brown Instrument Div., has announced Catalog 8502 which describes louver, round, mixing, outlet and fire dampers for regulation of air flow in industrial applications, also electric, pneumatic and manual operators. Application data, velocity-pressure drop charts, and damper ratings for electric and pneumatic operators are included.
- 12 **DIESEL ENGINES**—Detroit Diesel Engine Division, General Motors Corp., has released the fall issue of "Power Parade," Vol. 5 No. 3, dealing with diesel engine applications in the industrial, marine and petroleum fields.
- 13 **DUST FILTER**—The Day Co. has released an illustrated dust filter bulletin (No. 528) dealing with all the aspects of dust control as achieved by the Hersey-type dust filter. The claimed advantages of the filter are explained by charts, diagrams and capacity ratings. A Dust Problem Analysis Sheet and photos of engineered and installed layouts are also presented.
- 14 **EDDY-CURRENT MACHINERY**—Dynamatic Corp. has announced Bulletin GBI on its eddy-current rotating equipment. The 15-page booklet includes basic operating principles, characteristics, types and typical applications of the machinery. Couplings, brakes, dynamometers and Ajusto-Speds units are pictured and explained.
- 15 **ELECTRIC POWER**—Westinghouse Electric Corp. has issued Booklet B-5447, on electric power distribution and protection for open-pit mines and quarries. Ratings of transformers, shovel performance, power factor correction, and distribution system layouts for different types of operations are covered. A discussion of various systems used for ground protection is given. Recommendations for substation protective apparatus are included, and the company's available equipment line is described and illustrated.
- 16 **EQUIPMENT PRODUCTION**—Caterpillar Tractor Co. has released a 12-page booklet, Form 30429, explaining how equipment is "Engineered to Perform." Special tests and experiments are pictured and described. The history of the manufacturer's oil filter development is also included.
- 17 **FLEXIBLE TUBING**—Flexible Tubing Corp. has announced its line of flexible tubing in Bulletin C2-3. Industries and applications recommended for the different types of ducting are listed.
- 18 **FLOTATION**—Denver Equipment Co. has released Bulletin No. A2-B3 titled "How Conditioning Efficiency Increases Flotation Recovery." The bulletin gives diagrams, specifications and dimensions of the manufacturer's super-agitator and conditioner.
- 19 **FORMS**—Symons Clamp & Manufacturing Co. announces the availability of its 4-page bulletin "How to Erect the Symons Forming System." Claimed erecting and stripping advantages are explained and detailed information is given on the various panels.
- 20 **HYDRAULIC TOOLS**—Blackhawk Manufacturing Co. has published a job-picture book to show how hydraulic tools can solve production, construction, maintenance and other problems. Typical job photographs suggest the general principles of the applications of portable and hand tools.
- 21 **KILN FIRING**—The Babcock & Wilcox Co. has published Bulletin C-12 on its direct-firing system for rotary kilns. Claimed advantages are listed and explained, cross sectional views are shown and many diagrams and illustrations are included. Air and moisture graphs are also included.
- 22 **LABORATORY PLANNING KIT**—Fisher Scientific Co. has announced a kit which permits designing custom installations of entire laboratory rooms without blueprints or conferences. The kit contains scaled cut-outs, representing 21 ready-made, pre-engineered steel furniture units. Included also is graph paper, a dimensional booklet and a complete catalog of unitized furniture and photographs of suggested laboratory installations.
- 23 **LOADING DOCKS**—Magnesium Company of America has published a bulletin describing its dockboards. The bulletin shows the bridge plates in action on users' docks. Information concerning cost-, time- and labor-saving features is included.
- 24 **LUBRICATING SYSTEM**—The Farval Corp. has announced Bulletin No. 15 on its Multival lubrication system.
- 25 **LUBRICATION**—The Farval Corp. has published Bulletin No. 125 titled "Centralized Systems of Lubrication." Diagrams, color illustrations and cutaway views are given. Claimed advantages are listed, action pictures are included and fittings and accessories are shown.

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- 26 **MASONRY COATING**—Tamma Industries, Inc., has released folders, color cards and a bulletin on its product "Agraseal," a masonry coating that is said to be water repellent. The color cards picture the selection of seven shades and white. Bulletin illustrates the applications of the coating.
- 27 **MATERIAL HANDLING** — Towmotor Corp. has published a booklet titled "How to Catch Man-Hour Thieves," which tells why inefficient materials handling handicaps successful production. The book covers the major causes of man-hour losses.
- 28 **METAL CUTTING**—Arcair Co. has released a bulletin telling how to gouge and cut all metals with only a carbon arc and compressed air. It illustrates typical applications in foundries and by fabricators. Photographs show applications for maintenance in industrial and construction fields. Operating instructions are also covered.
- 29 **METAL FABRICATION**—Kirk & Blum Manufacturing Co. has released a "sheet and plate fabrication" brochure illustrating the company's fabricating plant and manufacturing facilities. The catalog gives a view of many of the typical parts and products regularly manufactured by the firm.
- 30 **OIL BOOSTER**—Cleaver-Brooks Co. has released Bulletin AD-108 on its Peak-Temp oil booster. The bulletin points out the features of the booster and lists specifications of the heating element, shell fittings and oil burner equipment.
- 31 **PNEUMATIC TRANSPORT** — Kennedy Van Saun Mfg. & Eng. Corp. has issued Bulletin No. 52-F on pneumatic transport systems for dry, pulverized materials. Illustrations, construction diagrams and specification charts are given.
- 32 **POTENTIOMETERS** — Minneapolis-Honeywell Regulator Co., Brown Instruments Div., has issued specification sheet 179 which gives details of the Brown Electronik strip chart potentiometer with two second full scale pen travel.
- 33 **PUMP**—Allis-Chalmers Manufacturing Co. has released Bulletin 52B6691A describing its frame type centrifugal pumps. Cross section diagrams, dimensions and performance curves are given.
- 34 **RECORDERS AND INDICATORS**—Minneapolis-Honeywell Regulator Co., Brown Instruments Div., has released Catalog 1520 that gives information concerning non-control precision instruments, which employ a potentiometer, Wheatstone bridge, or other measuring circuit to measure temperature, pressure, flow, pH and other variables. Specifications for each particular model are given. Also included is information on specially adapted instruments such as the electrometer, function plotter, scanning system, "TV dial" recorder, double range precision indicator, and console desk precision indicator.
- 35 **RUBBER**—Goodyear Tire & Rubber Co. has published a brief history of the company in a 24-page booklet. Illustrations of the company's plants here and abroad are shown.
- 36 **RUBBER COATING** — Linatex Corporation of America has released Form L-101 on its rubber coating material, which is claimed to be abrasion, corrosion, vibration and chemical resistant. Method of fabrication and typical applications are illustrated.
- 37 **SAFETY**—E. I. Du Pont De Nemours and Co. has released a booklet which describes its safety program. Safety apparel, technologic devices, safety practices, public safety, management's role, construction safety practices, safety tests, and research are all covered.
- 38 **SCREENS**—Allis-Chalmers Manufacturing Co. has announced Bulletin 07B7868 which describes its line of vibrating screens for the mining industry. A typical flow sheet is included showing how horizontally operated low-head screens are used in the sink and float process.
- 39 **SILICOFLUORIDES** — The Davison Chemical Corp. has issued Form No. 27, describing and illustrating applications of magnesium-zinc silicofluorides for hardening and wear-proofing concrete, stucco, brick, mortar and plaster surfaces. Specifications, general directions, tests and advantages are given.
- 40 **SMOKE CONTROL**—Combustion Control Corp. has issued Bulletin CM 506 which describes a new control, the photo-electric smoke indicator-series FE. Construction features and specifications are given.
- 41 **SPEED REDUCERS** — The Cleveland Worm & Gear Co. has released a bulletin telling of its pioneering progress with worm gear speed reducers. Some of its newest models are shown.
- 42 **SPRAY VALVE**—The Farval Corp. has released Bulletin No. 60 which describes its spray valve for controlled spraying of lubricants onto open gearing, slide surfaces and other open bearing areas.
- 43 **STEEL**—Pyramid Steel Co. has published a handbook on its line of tool and special purpose steels. Illustrated and described are steels for complete maintenance and repair purposes. The book includes welding instructions for maintenance applications, tables and information on steel hardness numbers plus approximate hardness conversion numbers for steel. Specifications, applications and operating instructions for use by plant operating personnel are included.
- 44 **TACHOMETERS**—The Bristol Co. has released a bulletin describing its full line of recording and indicating electric tachometers. The instruments described include models for measuring speed of rotation or travel, processing time, speed ratios, sum or difference of speeds, and average of speeds. Featured in the bulletin are the electronic Dynamaster recording tachometers.
- 45 **THERMOMETERS** — Minneapolis-Honeywell Regulator Co., Brown Instruments Div., has issued specification sheet 612 which describes indicating and recording thermometers with pneumatic control. Construction and engineering details are included.
- 46 **TRUCKS**—R. G. LeTourneau, Inc., has issued a 28-page booklet, Bulletin TK-137, describing and picturing its Tournarocker, a rear-dump haulage unit designed for off-road and highway hauling. Action photographs and cut-out illustrations of integral parts of the machine describe its main features.
- 47 **TURBINE-GENERATOR** — Westinghouse Electric Corp. has issued Bulletin B-5418 which illustrates some 30 applications of industrial turbine-generators. The booklet describes the six principal types of industrial turbines. Characteristics of each are described in terms of the electrical power and process steam each is capable of delivering.
- 48 **VIBRATING SCREEN** — Productive Equipment Corp. has announced Bulletin 552 on its Gyroset positive eccentric action vibrating screens. Construction designs are shown and individual features of the various models are described. A specification table is also given.
- 49 **WELDING**—Lincoln Electric Co., 27801 St. Clair Ave., Cleveland 17, Ohio, has published a 141-page book which explains the factors determining weldability; gives causes and cures for hard-to-weld metals; details welding procedures for steels, nickel, iron, copper, aluminum, hard facing and alloys. Price is 50 cents in the U.S.A., 75 cents elsewhere, postage prepaid.
- 50 **WIRE ROPE**—A. Leschen & Sons Rope Co. has issued a wire rope use and care booklet. The booklet contains 72 pages of information on proper methods of handling, reeving, breaking in, splicing, cutting, lubricating and specifying wire rope. Illustrations, diagrams and charts are included to demonstrate and explain suggestions and recommendations for proper wire rope use and care.

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(2-53)

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"have yet to replace any essential or expensive parts"

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GET THE FACTS ON **NAYLOR** Lightweight **PIPE**



Naylor is the one lightweight pipe with the built-in strength and safety required for push-pull ventilating as well as pressure air lines in mining service. It's easy to handle and install, especially with Naylor's Wedge-Lock coupling. It's extra strong because the Naylor Lockseam Spiralweld structure provides a distinctive reinforcing truss which adds collapse strength necessary for push-pull service. Naylor pipe comes in sizes from 4 to 30 inches in diameter.

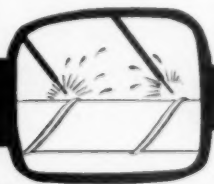
For full details, write for Bulletins No. 507, No. 513, and No. 514.

NAYLOR PIPE

NAYLOR PIPE COMPANY

1237 East 92nd Street, Chicago 19, Illinois

New York Office: 350 Madison Avenue, New York 17, New York



Blasting

(Continued from page 128)

two occasions in order to increase the delay period between rows, but the results obtained were inconclusive.

"In electric blasting, a delay period of 25 milliseconds between rows is generally used. Zero delays and 50-millisecond delays have been tried, as have 25- and 50-millisecond delays in alternate back row holes. However, the 25-millisecond delay seems to give as good results as the others. Detonation, incidentally, is always initiated at the center of the powder column in the hole.

"It is difficult to compare the two types of blasting, since it is customary to shoot with a slightly higher powder factor in the instantaneous blasts. Moreover, different blasting agents are used in the two types of shooting, so that any comparison involves these two variables. Experience and observation, however, indicate the following points of similarity and differences:

"1. **TOES.** In both cases, most of the charge is concentrated at the bottom of the back row of holes. Hence toes are never a problem, although high bottom between rows may be in some cases.

"2. **FRAGMENTATION.** Results are about equal. If the same powder factor were used in both cases, delay blasting would give superior results.

"3. **POWDER FACTOR.** Higher powder factors are generally used with instantaneous shots. This is considered an advantage as long as the throw does not exceed 75 ft., because of the additional breakage obtained.

"4. **VIBRATION.** Since vibration is not a problem, no attempt is made to control it or measure it.

"5. **BACKBREAK.** Little or none with delay blasting. With instantaneous blasting, considerable backbreak results. However, since rotary drills are used, bad backbreak does not present much of a drilling problem, and it may increase the fragmentation in the succeeding blast.

"6. **THROW.** Difficult to assess; it seems to be largely a function of the powder factor for any particular section of bank. Probably not much effected by delay blasting.

7. **COSTS.** Over-all costs per ton of broken stone are approximately equal.

"8. **MISFIRES.** There has been one misfire as a result of lightning setting off a portion of an electric blast. Occasionally a primacord line is cut during loading or stemming without being noticed, resulting in a misfired hole. In some cases, these misfired holes may be due to defective primers or other causes. Misfired holes are rare with electric caps, but do occur, possibly due to defective caps. There are no known cases of a hole misfiring due to a line being cut off under the action of the blast, even with delays as high as 75 milliseconds.

"To guard against premature blast-

(Continued on page 146)

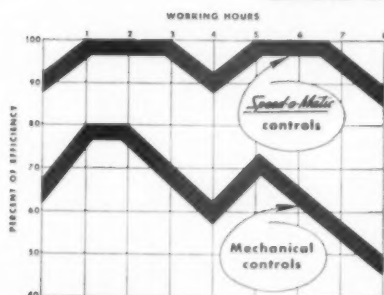
Before you buy:

CHECK EARNING POWER!



POLK CONSTRUCTION CO., Lakeland, Fla., reports they are "extremely pleased" with performance of this K-375, quarrying limerock.

Speed-o-Matic controls pay off in greater output and lower maintenance



Speed-o-Matic controls, with their fingertip operated levers, are responsible for the above startling evidence of how operator fatigue can be reduced.

Link-Belt Speeder's power-driven hydraulic controls reduce operator fatigue, minimize wear and tear on the machine and require far less maintenance than rigs with manual, air, vacuum or other control systems.

On tough rock jobs or ticklish steel erection—Speed-o-Matic control provides fast, safe, accurate, "feel the load" response—helps you do more work in less time at lower cost.

For details on the complete line of crawler, truck or wheel-mounted shovel-cranes . . . all their matchless output-boosting, cost-cutting advantages, ask your distributor or write for Catalog 2373.

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BUILDERS OF A COMPLETE LINE OF CRAWLER, TRUCK AND
WHEEL-MOUNTED SHOVEL-CRANES

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...EVERYWHERE**

NEW HOIST RATINGS prove St. Paul best!



Tear out this ad . . . use it to compare St. Paul's "bonus capacities" with any other hoist. You'll find St. Paul gives you far more payload capacity per lb. of weight — at all body lengths! Your truck dealer, or St. Paul distributor will also show you why St. Paul's advanced mechanical and hydraulic improvements mean lower installation costs, added hours of smooth, trouble-free performance. Get the complete story on these great new St. Paul dump body hoists today, or write for free illustrated folder. St. Paul Hydraulic Hoist, Customer Service Dept., 36123 Main St., Wayne, Michigan.

Model	Wt. lbs.	Payload tons at body lengths shown									
		7'	8'	9'	10'	11'	12'	13'	14'	15'	16'
D-18	550	7	8								
H-18	650	9									
H-18	735		8	7	6						
H-20	785		10	9	8	7					
L-20	870		12½	11	10	9	8				
L-24	1020			12	11	10	9	8			
2 H 20	1370			17½	15½	14	13	12	11	10	
2 L 20	1555			22½	20	18	16	15	14	13	
2 L 24	1695			27½	24½	22	20	18	17	16	

...also check St. Paul's complete new line of matching dump bodies



MODEL 301 Triple-strength contractor's body with pyramid side braces and boxed corner posts.



MODEL 106 Drop-side body with hinged sides and tail gate for easy hand loading with shovel.



MODEL 103 Combination dump and platform body with removable sides and corner posts.



MODEL 311 Heavy-duty rock-type body with scoop end for easy dumping of bulky loads.

S-HBC-7

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HYDRAULIC

Hoists and Dump Bodies
Full-size Refuse Loaders
Elevating Gate Gates

lowest in reputation . . . lowest in cost-saving features

Labor Relation Trends

(Continued from page 61)

30, 1948, to May 15, 1949, plaintiff was employed by defendants as a watchman upon the Edsel Ford Expressway, which was then being constructed by defendants. Plaintiff filed an action claiming \$3950.96 for 1508 hours overtime work which he alleged had been wrong-fully withheld in violation of provisions of the Fair Labor Standards Act.

"In their answer defendants alleged in substance that plaintiff was paid overtime for all over 40 hours per week in accordance with the prescribed classification and rate of the Michigan State Highway Department rules and regulations covering the work done on the Edsel Ford Expressway. This allegation was not denied. A motion for summary judgment was filed by the defendants upon the ground that no genuine issue was presented as to any material fact. After hearing, the District Court held that upon undisputed facts the highway was entirely new and originally constructed, not following any existing right-of-way, route or trunk line, federal, state, county or city; that the work upon the expressway was not repair, maintenance or reconstruction of any existing facility; and that the plaintiff and his employers were not engaged in commerce or the production of goods for commerce. The court therefore held that the defendants were entitled to a summary judgment of no cause of action as a matter of law."

In spite of the intervention of the Secretary of Labor as *amicus curiae* (friend of the court), the appeals court upheld the decision of the lower court, in a decision which quoted a number of similar actions, and emphasizing the distinction between new projects and repair and maintenance of existing avenue of commerce. The effect of the decision may therefore be adverse to the point producers are trying to establish that materials produced for repair and maintenance, off the site of the job, are not covered by the F.L.S.A. in the definition "for use in interstate commerce."

California Limestone

SEVERAL California portland cement manufacturers and others reportedly have inspected a large limestone deposit in Bautista Canyon, near Hemet, California, as a possible site for a cement plant. Engineers estimate that the deposit contains 28,000,000 tons of high grade limestone.

To Build New Plant

NEW CASTLE LIME & STONE Co., New Castle, Penn., recently announced plans to build a \$100,000 plant at the old Mahoning Quarry near Lowellville, Penn., to replace the plant destroyed by fire last July. Completion of the new plant is scheduled for April, 1953.

for

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FORGED STEEL GRINDING BALLS

*Good for the
Long Grind*

You'll find CF&I Grinding Balls where the going is toughest. They're forged from special analysis steel to give high impact and abrasion resistance... wear evenly and stay spherical.

If you have any grinding problem, call upon CF&I metallurgists and engineers for assistance...they're always available to help you obtain the most from your grinding media.

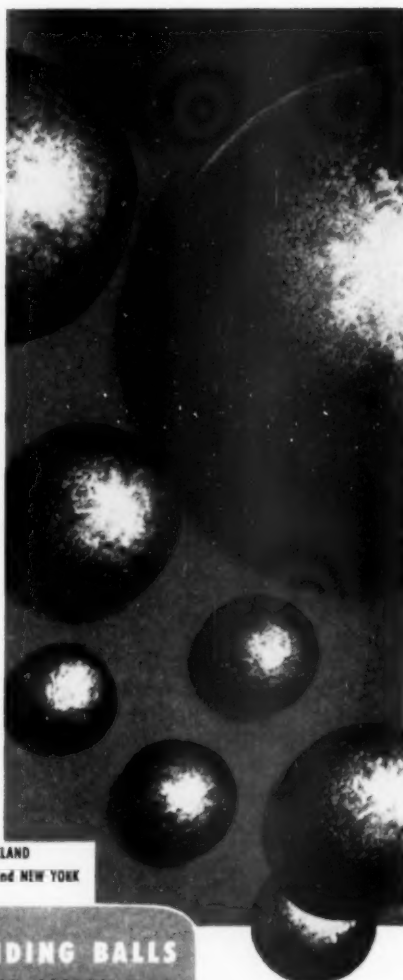
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FORGED STEEL GRINDING BALLS
THE COLORADO FUEL AND IRON CORPORATION



Drilling

(Continued from page 88)

bearing. The lubrication and cooling of these bearings is by means of the air which travels through special airways and, upon leaving the bit, augments the air for chip evacuation. These bearings (small as they are, to fit inside the cone) must distribute between all nine of them, the total of the downward thrust, plus the torque applied in rotation. It is easy to see that the greater the pressure exerted, the shorter the bearing life, and consequently the shorter the bit life. It is of interest to note that if one of the special airways becomes clogged, total bearing freezing occurs.

Decreasing the pressure below the yield point of the subject medium is no cure, because this eliminates all but frictional penetration and the stone is worn away at a slow rate with a high bit attrition. Again, theoretically, the rotation of the Hughes tricone bit performs two functions: first, it presents a new surface to be crushed; second, it throws out and uncovers for air evacuation, the residue of the previous tooth breakage.

Due to the cleanliness of the air in lubrication and efficiency for cooling, as well as speed in removing the crushed particles from the front of the bit, longer bit life and greater speed of penetration can be expected from machines using air evacuation instead of a water slurry.

Rotational speeds are as important to bit life as are the pressures: if the speed is way too high, a condition is reached wherein the downward pressure never does have time to fracture the stone, a condition akin to driving a car over a weak bridge at a very high speed, before the bridge can fail. Still more damaging is the effect of the high heat developed in the bearings. The slowest of speeds decreases the rate of penetration as fewer chips are broken per minute. The optimum speed is dependent upon the newness of the bit, the speed of penetration desired and the abrasiveness of the rock. When drilling abrasive rock, another factor regarding rotative speed should be considered: in this case, an increase in speed may momentarily increase penetration rate, but accelerate wear on the bit teeth to such degree that overall performance is decreased. Actually, the most desired rotative speed varies during the life of the bit.

The theory varies from the factual since there is a certain amount of shattering, due to the impact developed in the rotation of the cutting cones, and hitting by the next tooth. This principle heretofore applies directly to the W7R bit, which we use. The Hughes Tool Co. makes many different bits for drilling, each designed for certain stone; some of the bits made for softer stone actually apply a twisting motion to rip out the chips for faster penetration. The manufacturer can best advise which bit might



There's a growing preference

for **ROLLWAY**
BEARINGS

...and with good reason!

Unwavering right-line rotation—free of skew, side-shock and end-rub—greatly extends the life expectancy of a Rollway Roller Bearing. Add to longer life the definite gains in smoother operation and lower maintenance costs and it's understandable why, today, demand for Rollways has reached a new peak.

Our increased facilities are expanding Rollway output as fast as possible. We are continuing to improve the balance between supply and demand, so that service to both established and new customers will be geared to their quantity requirements . . . another reason why bearing users can confidently specify "The bearings that *roll* right because they're *made* right."

Our complete engineering and metallurgical services will gladly work with you on your problems. Simply write or wire any sales office. No cost. No obligation.

Rollway Bearing replacements are available through authorized bearing distributors in principal cities. Consult your classified 'phone directory.

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RIGHT ANGLE

ROLLER ENDS, precisely square to avoid end-rub, oscillation and side-shock.



RIGHT ANGLE

BEARING SURFACES with parallelism that results in unwavering right-line rolling.



RIGHT ANGLE

SEPARATOR SLOTS accurately machined to prevent roller skew, slide and uneven wear.



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BEARINGS

Complete Line of Radial and Thrust Cylindrical Roller Bearings



- ✓ Built to withstand the punishment of handling heavy loads of rock when loaded with big buckets.
- ✓ Rock bodies fabricated of $\frac{1}{4}$ (or heavier) steel plate for maximum strength.
- ✓ Rigid reinforcing provided with box-member ribs. Scoop ends standard.
- ✓ Floor has 2" hardwood cushion, sandwiched between truck bottom and $\frac{1}{4}$ " wearing plate, to absorb loading shock.
- ✓ Reinforced steel subframe welded integrally with the body to support the load uniformly and distribute the lifting forces of the hoist without bulging or distortion.
- ✓ Subframe construction with both cross members and long members interlocked and welded into a single assembly to prevent sagging of body floor.
- ✓ Individually engineered to your requirements for body length and load distribution.

Strong Arm HOISTS

- ✓ Arm assembly made of structural steel welded to extra heavy reinforced tubing.
- ✓ Simplified design eliminates unnecessary troublesome parts. The simple toggle principle of the linkage requires extremely low oil pressure.
- ✓ Hoist frame designed to take all stresses imposed by action of the hoist without transferring any stress to truck frame.
- ✓ Endurance-tested hoist cylinder is precision-engineered to raise and hold loads efficiently and dependably.
- ✓ Fast-acting hoist mechanism elevates body to over 50° dumping angle within 12 seconds after raising cycle is started.

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13 AND 18-YD.
HEILINER SCRAPER

20-YD. BOTTOM
DUMP WAGONS

CONTRACTOR'S
BODY

be most suitable for the kind of stone to be drilled.

There are several other factors which must be considered in making the decision as to whether a rotary drill should be installed. The rotary drill is necessarily a heavy machine and due to the weight, it is ungainly and difficult to move over any rough terrain. At this operation, it has been found necessary to build special roads, and to shoot benches for the machine upon which to work. Also, due to its speed, the machine is harder to handle in seams and crevices; however, under this latter condition, there is a redeeming factor. In passing through a mud seam, the heat of drilling, augmented by the heat of the air, partially bakes any mud and thoroughly chokes seams with dust—as a result, the holes are comparatively dry when loaded. Due to the speed of drilling, even many of the harder stones such as granite may be drilled at a per yard cost which can result in savings.

Loading becomes an interesting consideration: the rotary holes are so smooth that we drop the powder (Trojan) and, since the shucks are light, we have obtained excellent compaction. A shot calling for about 17 tons of explosives loads in about 4 hr., compared to 12 hr. with well drills.

Since holes can be drilled so rapidly, a much more satisfactory breakage can be attained, since the addition of one or two holes for obtaining the desired loading factor on each hole becomes a minor problem for the engineer in laying out the drilling plans.

For the small operator, an investigation should be made into the possibility of contracting the drilling with an independent driller who could handle several quarries with one rotary drill. Contracting this way would preclude the problems of joint-ownership, and the machine could be kept in top condition with a fully qualified crew.

Talc Report

THE CALIFORNIA STATE DIVISION OF MINES recently published a 22-page report on "Geology of the Superior Talc Area in Death Valley," by Lawrence A. Wright of the Division of Mine's staff. Included are maps of the mine claims and workings, microsketches of commercial talc specimens, a geologic map of the deposits and several illustrations. The report is available for \$0.50, from the Division of Mines office at 217 First St., Room 402B, State Building, Los Angeles, Calif.

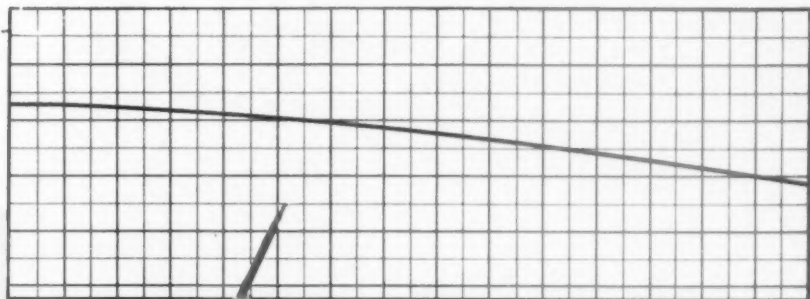
Change in Firm Name

THE CORPORATE NAME of Michigan Limestone Division, United States Steel Co., Detroit, Mich., has been changed to Michigan Limestone Division, United States Steel Corp., effective January 1, 1953. United States Steel Co. has been merged into United States Steel Corp.

P&H

Diesel Engines

(2-CYCLE)

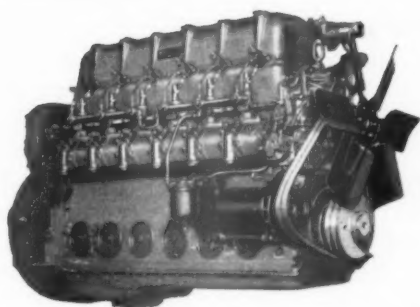


*Can your diesels
match this
torque curve?*

This is the torque curve for the P&H Model 687-C Diesel Engine. Note how the torque characteristics are sustained throughout its entire horsepower range.

That means steady, responsive power at all speeds — greater lugging "ability" for those toughest jobs. It's the kind of unfaltering performance that assures more profits in any service, constant or intermittent.

Steady torque for steady work is just another outstanding feature of P&H Diesel Engines — America's most advanced line. Ask your P&H Diesel representative for the full story. Or write for literature.



P&H Diesel Engines are built in 1, 2, 3, 4 and 6-cylinder models — up to 145 h.p.

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PRE-FABRICATED HOMES



ELECTRIC HOISTS



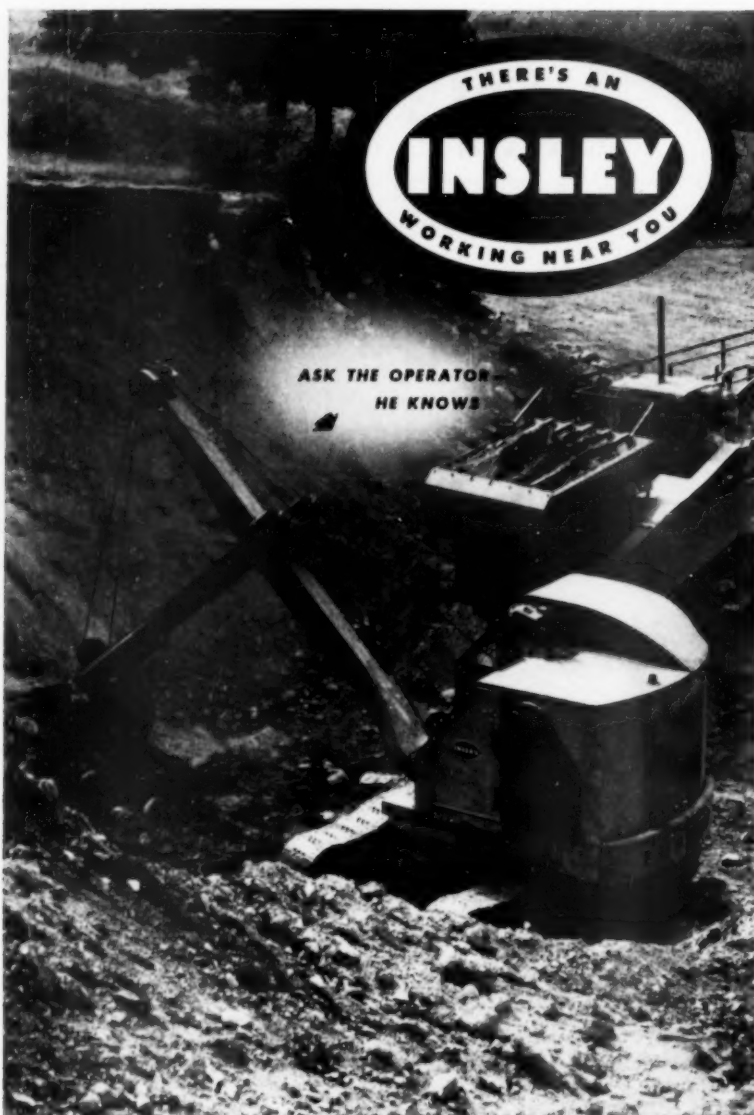
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OVERHEAD CRANES



The **INSLEY** operator knows..



that Insley Equipment can be rated-for-the-project . . . he knows that specification alternates make it possible to buy the exact equipment to do his job best.

INSLEY MANUFACTURING CORPORATION • INDIANAPOLIS 6, INDIANA

Rocky's Notes

(Continued from page 55)

is less likely to happen if we use water glass which does not have Si-OH, but Si-O-Na groups. Nevertheless these groups hydrolyze readily in contact with other materials, such as cellulose, and enter similar reactions as a glass surface."

We have quoted that because of the interesting facts on silicate chemistry it brings out. In the case with the adhesive referred to above, a sodium silicate film is the kind desired, but there are other applications where a silica film is what is wanted, and here it is only necessary to remove the sodium and leave the relatively pure silica gel. The sodium silicate solution is merely a convenient way of distributing the film. Moreover, the sodium in inorganic binders does not necessarily have to be removed, since it can be fixed in some way just as it is in many minerals, which are at least permanent in the sense that most concrete is permanent.

Sodium Silicate in Concrete

Concrete researchers have been imbued with the theory that all soluble silicates that may incidentally occur in concrete are an abomination, but obviously that is not necessarily so. Dr. Vail reports: "It is fully established that portland cement mortars after first being fully set are improved by impregnating them with silicate solutions sufficiently dilute to penetrate deeply into the porous structure of the set body. Thus the permeability of the concrete is reduced, and its resistance to wear increased, as shown by hydraulic and abrasion tests and by long experience in the treatment of concrete surfaces to prevent dusting and the penetration of oily and aqueous liquids. Silicate impregnation works best on concrete bodies which are sufficiently matured to be substantially free of calcium hydroxide which, by precipitating the silicate, retards penetration and interferes with the development of the desired calcium silicate and aluminates and their hydration. The reaction of lime and silicate solution is probably an advantage after the silicate has filled the pore structure [of the concrete]."

That sodium silicate *per se* is not detrimental to concrete is apparently proved by cements compounded of European trass (a pozzolan), lime, sodium silicate with small percentages of calcium sulfate (natural gypsum) and portland cement. Dr. Vail reports that such a cement is used to make stucco, and that the mortar made with it has greater "dimensional" stability and smaller exothermic reaction than similar portland cement mixtures. Hence, it has proved especially adaptable for dams, bridge piers, filter plants and chemical works. The typical composition of such a cement is given as follows:

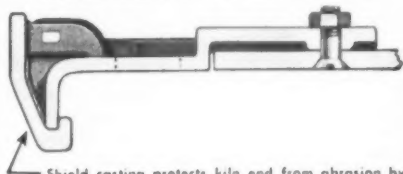
50 percent raw trass
42 percent calcined lime



THERMALLOY* KILN END "RETIRED" AFTER 15 YEARS' SERVICE

NEW PATENTED SEGMENTAL DESIGN

Kiln is protected by high heat resistant Thermalloy, to distance of 16½" back from mouth.



Back in 1935, the Ideal Cement Company of Okay, Arkansas, purchased a spare set of Thermalloy Kiln Ends. Yet they were actually placed in service only during the past year.

Reason: life of the original Thermalloy Kiln Ends was far beyond expectations—15 years to be exact.

Such service life is unusual, of course. But it does prove that Thermalloy's excellent heat-resisting properties give exceptional service life. In addition, the new segmental design illustrated at the left provides extra advantages.

One of our engineers will be glad to show you how Thermalloy's properties plus our improved segmental design lengthen kiln-end life. Write Electro-Alloys Division, 4005 Taylor Street, Elyria, Ohio.

*Reg. U. S. Pat. Off.

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GRIP *for* GREATER GRABS



To grab and to hold safely is the function of a grapple.

The Owen Grapple alone has independently acting tines each of which contacts the object to be lifted, regardless of its shape, and grips it with heretofore unknown tenacity. These photos tell the story.

The Owen Grapple opens wide to grasp large objects. Fast, safe operation is assured indefinitely because of the tremendous grip, scientific design and the use of the best materials available.

THE OWEN BUCKET CO.

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Rocky's Notes

(Continued from page 142)

3 percent gypsum
5 percent cement clinker
15 percent $\text{Na}_2\text{O} : 3.5 \text{ SiO}_2$

The sodium silicate is in anhydrous form, and all the ingredients are ground together. Such cements are said to be superior to portland cement not only in strength of concrete but to make concrete that is more resistant to disintegration from salt solutions such as of magnesium chloride and magnesium sulfate, and they show far less heat of hydration. Such cements give chemical analyses of from 33.1 percent of $\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$ to 37.3 percent of $\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$ with 48.7 percent $\text{CaO} + \text{MgO}$ to 36.5 $\text{CaO} + \text{MgO}$. In other words, the so-called 50-50 trass cement is about even in percentages of SiO_2 and CaO . In each case the sum of the percentages of Na_2O and K_2O is over 2.0 and in the case of the 50-50 trass cement is 3.3 percent. From these facts, our own conclusion would be that there should be no objection to at least 3.0 percent of combined soluble alkalis in cement, provided they are properly distributed or incorporated and properly bonded in the finished cement chemical structure as a whole. Certainly there is a great deal still to be learned about the function of soluble silicates in cements and concrete.

Indiana Industrial Sands

INDIANA GEOLOGICAL SURVEY has announced the publication of Bulletin No. 7, "Industrial Sands of the Indiana Dunes," by C. L. Bieber and Ned M. Smith. The report contains a summary of the geologic history of the deposits, sieve analyses and other data of nine samples of sand, methods of exploitation, and uses. A map shows the active areas, mined-out areas and sand resources in relation to ancient and present shore lines. Copies of the report may be obtained for \$1 each, from the Publications Office, Geological Survey, Indiana Department of Conservation, Bloomington, Ind.

Cement Plant Sold

THE COWELL CEMENT PLANT and equipment, formerly owned by Henry Cowell Lime and Cement Co., Cowell, Calif., was recently sold at a liquidation auction. Sales of plant equipment totaled about \$500,000, while the plant building brought approximately \$200,000. The plant, built in 1908, had been closed since 1946. It was originally valued at \$12,000,000.

New Market for Silica Sand

A NEW PROCESS for the production of sodium silicate, in both solid and solution form, is expected to open up a new market for silica sand. Davison Chemical Corp. will utilize the new process at its new plant being built at Lake Charles, La., which will have a 300-ton daily capacity.

A gravel pit owner reports ...

J & L JALLOY

"HAD 'EM SKUN A MILE"



At Left—Walter Stevens holds up J&L Jalloy cutting edge which lasted 2½ years before replacement. Only ½" thinner than when new.



Above—It takes tough steel to withstand digging material like this!



Above—Walter Stevens rams loader bucket into gravel bank to pick up another load of gravel.

**MAINE STEEL INC. uses
tough J & L JALLOY**

to decrease "Downtime" on Hydraulic Loader at H. H. Stevens Co.

We're pretty pleased with the way Mr. Walter Stevens of H. H. Stevens Sand & Gravel, Gorham, Me., feels about J&L Jalloy.

Mr. Stevens is using a "Straight-Line" hydraulic loader, built by Maine Steel Inc., to load trucks with the sand and gravel from his pit. It's tough work. The loader bucket is rammed into the gravel bank at high speed reverse, which means the severest kind of impact and abrasion on the equipment.

To decrease service interruptions to the work of its loaders, Maine Steel has used ½" x 6" Jalloy plate for the bucket's cutting edge.

Here's how Jalloy has worked out—

Mr. Stevens reports, the first cutting edge of Jalloy lasted 2½ years—loaded 40,000

cubic yards of sand and gravel.

Mr. Stevens sums it up this way. "That blade saved me quite a bit of money."

And Maine Steel Inc. is pleased with J&L Jalloy too—

P. J. MacDonald, Maine Steel Welding Foreman, reports Jalloy is no trouble at all to weld using a regular coated rod.

Finally, Mr. G. C. Soule, President of Maine Steel, says that HE'LL CONTINUE TO SPECIFY J&L JALLOY FOR ALL CUTTING EDGES.

Why not write today for our booklet, "For Longer Wear . . . Less Repair." It will give you complete information on Jalloy, plus examples of how other mining and quarrying men are using this modern mining steel to save them money. The coupon is for your convenience.

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STEEL**

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Please send me a free copy of your booklet, "For Longer Wear . . . Less Repair."

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Portland, Oregon
Los Angeles, Calif.
Salt Lake City, Utah

6

Blasting

(Continued from page 134)

ing when firing with electric caps, it is customary to wait until the blast area has been cleared before hooking the cap wires to the trunk line. As soon as all cap wires have been hooked in and checked, the crew proceeds to the end of the trunk line located a safe distance from the shot, hooks in the source of electric power, and fires the shot immediately."

High Face Dolomite Quarry—(37)

Methods employed in the quarry with the highest face drilled, as represented in our letters, were summarized briefly in the following:

"Our deposit is a horizontally stratified dolomite which, due to dry seams, tends toward slight backbreak. Our face is about 210 ft.

"Our spacing and burden are computed separately for each hole, the burden being kept to a minimum and the spacing such that the loading factor will be 3.3 tons of stone to the pound of powder. We prefer to shoot over 15 holes if possible, using a 20-millisecond delay. We use electric caps on primacord at each hole and fire by switch. The detonation is from the top, our reasons being safety (no caps in the hole) since we must wait long periods for clearance from the nearby railroad to shoot, then must complete the hook-up and fire with a minimum of delay. We use progressive shooting since it enables us to move the stone from a tight corner. By maintaining a loading factor of 3.3 and drilling all holes 7 ft. below the quarry floor, we have a minimum of toe. Delays have saved us 75 percent of the secondary shooting and the better fragmentation has increased production since there is less delay at the shovel. We have not noticed any differences in the primary powder used, but have a better over-all powder consumption. Our backbreak is about the same, however we have noticed good control in both the position of the stone pile and the shape of the pile in using delays. We can move the pile horizontally parallel to the face (towards the first hole fired) about 40 ft."

Soft, Tough Rock Asphalt—(38)

This Texas deposit is of soft, tough stone that is massive with few seams. Height of face is 65 to 80 ft. and from 6 to 10 holes, spaced 26 ft. with 35-ft. burden, are fired per shot. They are 10-in. drill holes spaced in a single row, and are fired with a delay period of 20 milliseconds between holes, progressively. Primacord in each hole is detonated with delay caps in each hole, for bottom detonation. The sequence is from the center to each side. There are no toe problems. Two caps are placed in each hole for insurance against misfires.

At a second rock asphalt plant in the same general area, face height is 85-125 ft. Spacing of blast holes (9

in.) is 27 ft. with 21-ft. burden, single row, and from 9 to 25 holes comprise a shot. A skipped delay period, 1, 3, 5, is used between holes which we assume means an interval of about 50 milliseconds. Detonation is at the bottom. Through use of electric caps, better blending of the material from the various strata is accomplished. The pattern is progressive and drilling is to 3 ft. below the floor.

Dolomite of Variable Hardness—(39)

This quarry was one of the pioneers in millisecond delay blasting. Practice and experience are summarized in the following:

"The rock is a formation of dolomite which varies in hardness at different points in the quarry. Approximately 60 percent of the rock produced is crushed to a size of minus ¾ in. and used in rotary kilns.

"Two Bucyrus-Erie 120-B shovels with 4-cu. yd. buckets are used for excavation. Four Autocar diesel trucks, holding 20 tons each are used to haul the rock to the primary crushing plant, where it is dumped directly into a 60- x 84-in. jaw crusher, the rock is then put through an 18-in. gyratory crusher, from which it goes to a surge pile and thence to further sizing and washing operations.

"The face of the quarry is 2100 ft. long with an average height of 63 ft.

"The primary blast holes are drilled with two Bucyrus-Erie 29-T drills and one 42-T drill. They drill 9½-in. diameter holes with a 30-ft. spacing and 15-ft. burden and 6 ft. below the established quarry floor.

"Two rows of holes are drilled across the face at the same time, but only a single row is shot with 7 holes in each shot. This is done for less vibration and better breakage.

"The quarry is divided into eight sections for the purpose of keeping records on digging, breakage and powder. In five sections the shots are detonated with two progressive caps in the bottom of each hole with primacord leading up to detonate the deck loads. The other three sections are detonated with primacord in the hole and each hole is detonated with progressive caps at the top of the hole.

"A slow velocity 9-in. diameter powder is used for best results in breakage and toes are a thing of the past.

"When instantaneous caps and small diameter holes were used, one pound of secondary powder was used for 40 tons of stone produced. Today the production is over 300 tons for every pound of secondary powder. The breakage of rock in the crusher is also better by at least 20 percent. The powder factor for instantaneous shooting was 2.8 tons per pound of powder, whereas for millisecond delay caps it is 2.5 tons per pound of powder.

"All precautions are taken in regard to safety in loading. No electrical wires are within 200 ft. No air

(Continued on page 134)



4 powerful reasons why you get more of what you want in 1953 CHEVROLET Advance-Design Trucks

MORE TRUCK FOR LESS MONEY! Chevrolet trucks list for less than any others of comparable specifications. Yet they bring you features and advantages found in few other trucks. For example, the advanced Loadmaster engine—standard in 5000 and 6000 Series heavy-duty and forward-control models (optional on 4000 Series heavy-duty trucks)—now has a new high-compression ratio of 7.1 to 1, and delivers even more horsepower than before.

FACTORY MATCHED TO YOUR JOB! Every unit of the Chevrolet truck you buy is balanced to the job. Tires, axles, springs, engine, frame, body and brakes form a team carefully engineered for the greatest efficiency—and the lowest cost.

GREATER VALUE IN FEATURE AFTER FEATURE! Two great valve-in-head engines—the Thriftmaster and the Loadmaster—provide greater gasoline economy. Hypoid Rear Axle, Unit-Designed Bodies, Flexi-Mounted Cabs and many other Advance-Design features offer value unmatched by any other truck at such low cost.

MORE RUGGED THAN EVER! In 1953, Chevrolet trucks are even sturdier. Bigger, more durable brakes on many models; heavier, more rigid frames and stronger construction lengthens truck life and lowers your hauling costs. See your Chevrolet dealer. Chevrolet Division of General Motors, Detroit 2, Michigan.

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—the Loadmaster or the Thriftmaster—to give you greater power per gallon, lower cost per load. **POWER-JET CARBURETOR**—for smooth, quick acceleration response. **DIAPHRAGM SPRING CLUTCH**—for easy-action engagement. **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **HYPOID REAR AXLE**—for dependability and long life. **TORQUE-ACTION BRAKES**—on light-duty and medium-duty models and on front of heavy-duty models. **TWIN-ACTION REAR BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—for greater holding ability on heavy-duty models. **CAB SEAT**—with double deck springs for complete riding comfort. **VENTI-PANES**—for improved cab ventilation. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—for easier handling. **UNIT-DESIGNED BODIES**—for greater load protection. **ADVANCE-DESIGN STYLING**—for increased comfort and modern appearance.



More Tonnage



"Cape Ann" Forged Steel Drop Ball

Ruggedly designed and drop tested to insure maximum breakage. Lifting link protected by deep recess to minimize cable replacement. Adaptable for swivel or shackle.

Used by leading quarries for economical secondary breakage.

2000 to 8000 lbs.

Prompt Shipments

For further information write—

**Cape Ann Anchor &
Forge Co.**

Post Office Box 360
Gloucester, Mass.

Diversify

(Continued from page 86)

which is the source of aggregates. Practically the entire production is of sand and gravel block, using air-entraining cement for purposes of plasticity of the mix.

The plant has a Besser Super-Vibrapac and its production is rated at 1½ million 8-in. equivalent units annually on the basis of one-shift operation. It is a neat layout and has a completely paved (concrete) yarding area. Aggregates are trucked to the plant hopper and elevated into a three-compartment bin, and cement is stored in bulk. Mixing is done in a 50-cu. ft. Besser mixer. Racks are handled by Towmotor and steam curing is done in six kilns of 7800 unit total capacity. Block are cubed by power and the storage area has a normal capacity of one-third million units.

Block are shipped over a 70-mile radius and the distribution of sales is about 50 percent for rural use and the balance to jobs in the many southern Ohio towns and small communities. The company has two of its own large flat bed, semi-trailer trucks and four tandem axle flat bed trucks and maintains a stock of units at the Circleville operation. Approximately one-half of total sales is through dealers, some of whom maintain stocks at their own yards. Ray Carroll is superintendent of the plant.

PLUM RUN STONE DIVISION

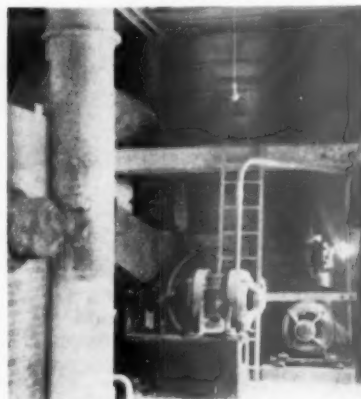
Commercial crushed stone, railroad ballast, agricultural limestone and a variety of pulverized stone products are produced by the Plum Run Stone Division with plant at Peebles, Ohio. The plant is in Adams county northwest from Portsmouth, Ohio, on the N & W railroad.

Originally, a plant was operated at Shimer just west of the town of Peebles. Early in 1940, the property, buildings and equipment of another company east of the town were purchased. Then, the Shimer plant was dismantled and equipment moved to the new location. "Plum Run," incidentally, is the name of a small stream alongside the plant and was applied to the new operation at the



Ammon J. Green, superintendent

time. Before the Division was established, the plant had operated under the name of Southern Ohio Quarries Co. Since then, the plant has been con-



Pulverizer installed for production of rock dust, fertilizer filler and superfine agricultural limestone

siderably revamped and now produces a great variety of crushed stone sizes. We very briefly describe the setup herein.

The deposit is almost a true dolomite and has variations in hardness and other physical characteristics that make it desirable to quarry the face on five benches. The faces average 12, 14, 22, 14 and 18 ft. in height, from top to bottom, and have definite shale partings between. Railroad ballast is taken from the third lift only,

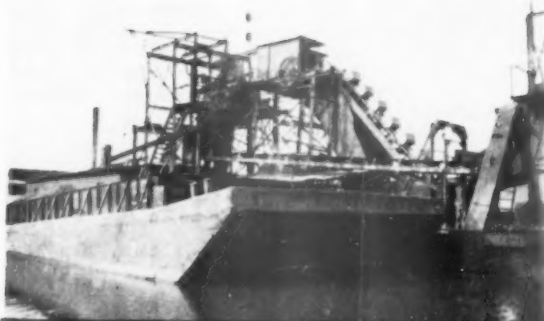
FARREL-BACON JAW CRUSHERS SIZES 60"x48" to 10"x7"

Optional design features include: (1) Meehanite frame, sectionalized when necessary; (2) removable water-cooled bearings; (3) improved design of swing-jaw bearing; (4) forced-feed oil lubrication, or circulating system if desired; (5) split flywheels; (6) flat or V-belt drive. Write for further details or engineering assistance.



FARREL-BACON
ANSONIA, CONNECTICUT

BA 4



*Mr. Rawn was
SURPRISED
to see that-*

"WEAR WAS NEGLIGIBLE"

ON HIS 12" THOMAS DURABLE DREDGE PUMP

OHIO RIVER DREDGING COMPANY

DREDGING AND TOWING

HUNTINGTON 10, W. VA.

November 15, 1952

Thomas Foundries, Inc.,
Birmingham 1, Alabama.

Gentlemen:

We examined our pump on November 16, having operated constantly for practically a whole season. We were surprised to see that wear was negligible.

This pump replaced a pump of another manufacturer. To have pumped the same tonnage through the pump so replaced, would have required five impellers and two shells. We are gratified to state that for this period we have not replaced a part in your pump or lost an hour due to failure of your equipment.

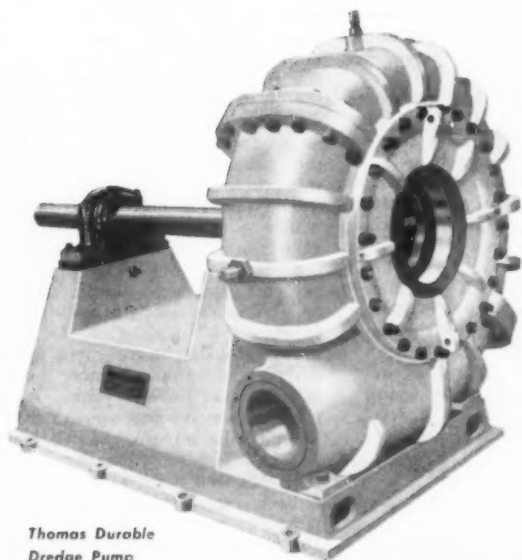
Your cooperation and your interest and suggestions in the use of our Thomas Pump have been greatly appreciated.

Yours very truly,

OHIO RIVER DREDGING COMPANY,

W. Rawn

President.



Thomas Durable
Dredge Pump

No wonder! What happened to him would surprise you, too.

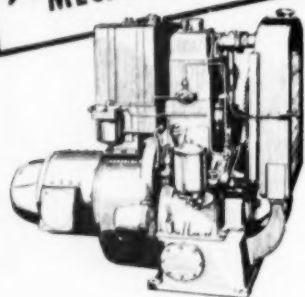
Mr. Rawn says the pump he formerly used in the same service, would have required . . .

- (1) Five new impellers,
- (2) Two new shells, BUT . . .
- (3) Thomas pump shows only "negligible wear".
- (4) It's not in his letter above, but Mr. Rawn stated verbally that he believed his Thomas pump (including all parts), is good for another whole season, without repair.

For complete information about Thomas Pumps,
write

THOMAS FOUNDRIES, INC., Birmingham, Ala.

**IF YOU DO IT WITH SAND & GRAVEL PUMPS,
YOU CAN DO IT BETTER WITH A "THOMAS"**



... NORDBERG DIESEL ENGINES are easy to operate— simple to maintain

You just don't need special mechanical training to operate and maintain Nordberg "4FS" Diesel engines.

Their basic design and construction makes them easy to start and easy to keep going—day in, day out, with a minimum of attention. Routine maintenance is extremely simple . . . all parts are easy to get at.

These are reasons why Nordberg 1, 2 and 3-cylinder "4FS" Diesels are more and more in demand for all kinds of power jobs from 10 to 45 hp—for electric service from 6 to 30 kw (6,000 to 30,000 watts)—and for pumping jobs from 200 to 3000 gpm at 15 to 240 ft. total head.

Mail the coupon for full details.

NORDBERG MFG. CO., Milwaukee, Wis.

NORDBERG

BUILDERS OF AMERICA'S LARGEST
LINE OF HEAVY DUTY DIESELS

MAIL THIS COUPON TODAY

Nordberg Mfg. Co., Milwaukee, Wisconsin

Send catalog covering Nordberg Type 4FS Diesels. I am interested in a unit for the following service:

Your Name _____

Company Name _____

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4-253

as an example of the selective quarrying practiced.

Drilling is done by two Ingersoll-Rand wagon drills which sink 2½-in. diameter holes. Holes are drilled with 6-ft. burden, 7-ft. apart, and an average primary shot is of 140-150 holes. They are fired with millisecond delay electric caps using five delays in sequence. Secondary breaking is done with a drop ball.

Excavating is done with a 2½-cu. yd. diesel-powered Osgood shovel and delivery to the primary crusher is by three Koehring dumpers hauling 8 to 9 tons per load. The primary breaker is a 30-in. Superior McCully gyratory. Its output is elevated and put over a 5- x 12-ft. triple-deck Allis-Chalmers scalping screen, from which the various sizes are routed according to requirements. Minus 8-mesh stone is taken off this screen into the agricultural limestone bin. Plus 3-in. stone is sent to a Kennedy Van Saun gyratory reduction crusher and a 3- x 1½-in. size to an impact reduction crusher, both of these crushers being in closed circuit with the scalping screen. Stone from 1½ in. to No. 8 in size is screened into the various required sizes over two washing screens.

Ballast (¾ to 2 in.) and pulverized agricultural limestone are produced interchangeably. When producing agricultural limestone, a minus 1-in. product from the scalping screen is fed through three Eagle hammermills, supplementing the minus 8-mesh product sized out from the same screen. Among other fine products screened are No. 9 (¾-¼ in.) for concrete block and sealcoat.

In 1948, a Raymond 5-roll, high-side pulverizer with double whizzer was installed to pulverize off-size stone into rock dust, fertilizer filler and super-fine agricultural limestone. An oil-fired furnace supplies heated air for the mill circuit. These fine products are pulverized to fineness specifications ranging from 100 percent minus 80 mesh, 100 percent minus 100 mesh, and 100 percent minus 200 mesh, for shipment in 50 and 80-lb. multiwall paper bags.

Capacity of the plant is rated at 350,000 tons per year, on a one-shift basis, of which about 25 percent is agricultural limestone and shipments are made throughout southern Ohio and into northeastern West Virginia. It is planned to double output in 1953, by installing the primary crusher in the quarry, providing a 3000-ton surge pile for better control of delivery to the plant, and by increasing to 2-shift operation.

Ammon J. Green is superintendent of this plant.

Limestone Quarry

MISSOURI VALLEY LIMESTONE CO., Des Moines, Iowa, has opened a limestone quarry five miles north of Council Bluffs, Iowa. The stone is being used to resurface Council Bluff streets.

N.A.L.I. Convention

(Continued from page 123)
every interested group talking the same language to the farmers.

Percentage Depletion

The subject of percentage depletion came in for much discussion following a talk on the subject by D. W. Williams, chief, National Resources Section, Bureau of Internal Revenue.



Vice-president John M. Deely, Leo Lime Corp., Leo, Mass.

Mr. Williams traced the development of the thinking which led up to the granting of percentage depletion and discussed the many complications to interpretation which have created so much confusion in the minds of producers and the revenue department as well. Final regulations had yet to be published at the time of the convention.

Congress allowed percentage depletion as a matter of grace in the first place he said, because of complaints about inequities in calculating depletion. Originally, cost depletion was the practice to compensate for the life of a mineral property whereby each unit of production was deductible as produced and sold, over the life of the property. Discovery evaluation was authorized during the war.

The idea of percentage depletion, which first was applied to oil and gas (7½ percent), was an attempt to establish a formula whereby a certain percentage of gross income would be deductible for tax purposes, but not to exceed 50 percent of net income. Many problems have come up since and various minerals were added to qualify over recent years. Agricultural limestone was one of 33 new non-metallic minerals added in 1951. After one year, interpretation was still confused, with mineralogical definition constituting the chief problem. For example, dolomite is given 10 percent depletion but the question is what constitutes dolomite.

The use test, as contrasted to chemical classification, was originated in the case of bauxite. That mineral is

(Continued on page 160)

HERCULES



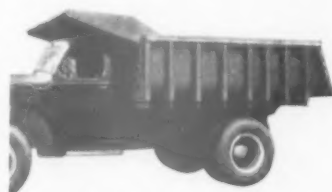
makes them all—and makes them better!



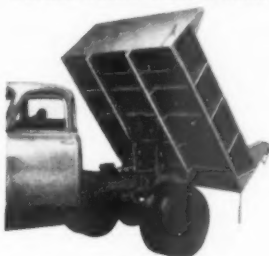
Hercules-Willard Concrete Mixer

CONTRACTORS' EQUIPMENT

Hercules-built Willard Concrete Mixers with "the big throat" charge and discharge faster; compact size and light weight. Hercules Heavy-Duty Rock Bodies and Hoists have proved their ability to stand up under severest tests on thousands of jobs from coast to coast.



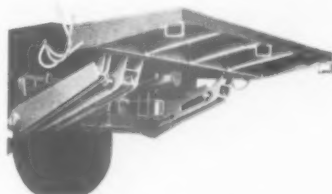
Rock Bodies and Hoists



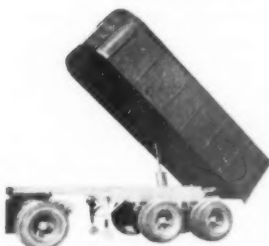
Dump Bodies and Hoists

TRUCK EQUIPMENT

No matter what your hauling or dumping needs, or what make of truck you use, it will pay you to choose from the complete Hercules line of Medium and Heavy-Duty Hydraulic Hoists, Dump Bodies, and Accessories (including Mechanical Power Chutes, Hydraulic Lift Tailgates, Spreaders). Many exclusive performance-boosting features.



Hydraulic Tailgate



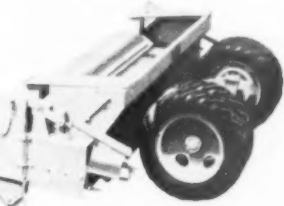
Tandem Trailer

TRAILER EQUIPMENT

Hercules Heavy-Duty Dump Bodies and Hydraulic Hoists are specially engineered for mounting on single axle, tandem axle, and 4-wheel trailers. Body lengths up to 20 feet; capacities to 25 tons.



4-Wheel Trailer



Cement Spreader

SPREADER EQUIPMENT

Hercules Cement Spreaders for soil stabilization projects spread desired amounts evenly up to 10-ft. width. Advance-designed Hercules units for spreading cinders, salt, sand, and chips are also available.



Chip Spreader

THE BIG NEWS is Hercules

... expanded engineering activity ... a fast-growing line of advanced equipment specifically designed to win out in comparison with any other makes ... plans for still more products that will do more work, faster, better, at lower cost. Ask your nearby Hercules Distributor for complete information or write the factory direct.

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**Lasts Longer Under
Stresses From Knots & Kinks**



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Knot it! Kink it—if you can! See how easily the patented braided construction of Tuffy Slings straightens out without damage. Only Tuffy gives you this extra flexibility and long-life strength—because *only Tuffy* has this 9 part machine-braided wire fabric construction that fights off knots and kinks, yet stands up longer when such stresses of distortion happen. Mail coupon below for your **FREE** 3-ft. sample of Tuffy Sling fabric and test it yourself!



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Specialists in Wire Rope and
Braided Wire Fabric

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☐ Send FREE Tuffy Sling Handbook and Rigger's Manual.

☐ Have my Union Wire Rope Fieldman bring me a FREE 3' sample Tuffy Sling.

Firm Name _____

Address _____

City _____ Zone _____ State _____

Beneficiation

(Continued from page 93)

finished material and may run as low as 0.4 lb. per ton. This low consumption is attributed to the thorough washing and excellent preparation that the dolomite gets in the preliminary washing plant. Freeing the matrix (and each particle) of dolomite from clay coatings, silt, etc., makes it easier to wash this medium from its surface in the H.M.S. recovery system and it aids in controlling the sp. gr. of the medium in the cone.

If an operator desires to test gravel for H.M.S. adaptability, preliminary testing can be done by using acetylene tetrabromide modified with carbon tetrachloride. This gives a clear solution with a specific gravity range up to 2.95. After adjusting the sp. gr. of the media to the desired point, immerse the gravel sample in the liquid and note the separations made. However, before buying a plant, final test work should be done by competent engineering groups. All the companies mentioned in this text who are exploiting the process have laboratory facilities available, at reasonable costs, to do all preliminary test work.

Before installing the H.M.S. process, the decomposed granite at Natividad was removed by screening after crushing. Selectivity in the quarry had to be practiced to keep wastage within economic bounds. As the quarry extended, the problem became more acute. The H.M.S. process not only increased the quality of the dolomite, but reduced the ratio of wastage and practically eliminated the need for selective quarrying.

The Salinas area plants comprise three units which are completely integrated. They are the previously mentioned Natividad dolomite plant, the Moss Landing Seawater Magnesia plant, and the Basic Refractories plant which is adjacent to the sea water plant. In the lime plant are three kilns; two are 8 x 300 ft. and one is 9 1/2 x 280 ft. A modified Schultess continuous hydrator is used. Three Raymond roller mills do the fine grinding.

The quarried material is loaded by a 2 1/2-cu. yd. Marion shovel and a 4-cu. yd. Bucyrus-Erie shovel, both electrically powered. Haulage is by rear-dump Euclids and wagons drawn by DW-10 Caterpillar tractors. The long grades are in the 7 to 8 percent range and this type of tractor has worked out very well for the stiff duty imposed.

Drilling is done with a rotary drill using coned Hughes bits that drill a 9-in. dia. hole. Depths of holes are in the 85-ft. range. The holes, drilled on 30-ft. centers with 30-ft. burden, are loaded with 40 percent Hercules Gelamite. Primacord and caps are the detonators.

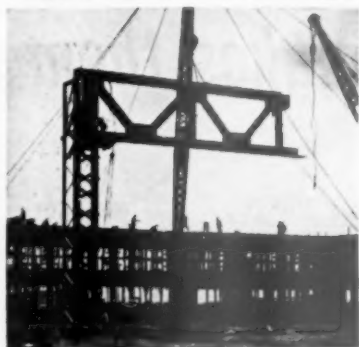
The primary crusher is a 36- x 48-in. Traylor jaw which is fed over a Sheridan grizzly. The crusher is set



Tuffy

SLINGS

Fight off Kinking!



"Couldn't Kink Them Even When We Tried"

**Says Owner of an Eastern
Construction Company**
(Name on Request)

This Pennsylvania construction company owner also proved to himself that Tuffy Slings are extra flexible, extra strong. Tuffy's patented 9 part machine-braided wire fabric construction gives you a fabric that can be repeatedly bent around abrupt corners. And even when one of the strands is broken or cut, there's no stranding! Give your workmen an easy-to-handle tool that eases and speeds the handling of loads . . . can help you save up to 40% on sling costs. Get Tuffy Slings!



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Specialists in Wire Rope and
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2156 Manchester Ave., Kansas City 3, Mo.

Please send my FREE copy of the Tuffy Sling Handbook and Rigger's Manual.

Firm Name _____

Address _____

City _____ Zone _____ State _____

Homocord Conveyor Belt—More use per dollar

Homocord Conveyor Belt—More use per dollar

Homocord Conveyor Belt—More use per dollar

Homocord Conveyor Belt—More use per dollar

Homocord Conveyor Belt—More use per dollar

Homocord Conveyor Belt—More use per dollar

CUSHIONED THROUGH AND THROUGH . . . To take the impact of heavy loading. That's why you get more ton-miles of service out of Homocord Conveyor Belt. This resilience withstands the abrasion and gouging of jagged rock, coal and ore. Its flexibility makes it a naturally deep troughing belt that trains easily on the idlers . . . able to haul heaping loads without edge-wear or spilling. Another R/M Conveyor Belt, Ray-Man "F", is designed for underground mining where pulleys are small and great flexibility and tear resistance are needed. Both of these R/M belts give you long life on the job, **MORE USE PER DOLLAR**. Ask the R/M distributor for Bulletins 6906 and 6915. R/M field engineers back him up, to give you **MORE USE PER DOLLAR**—not only in conveyor belts, but in hose, transmission, and V-belts.



MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Flat Belts



V-Belts



Conveyor Belts



Hose



Roll Covering



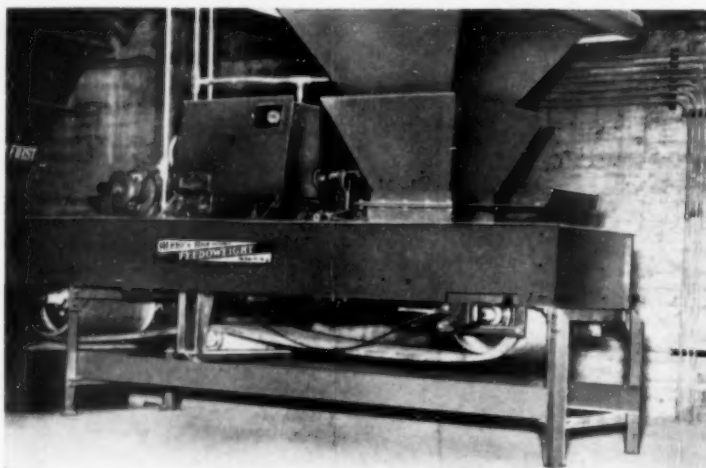
Tank Lining



Abrasive Wheels

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings • Asbestos Textiles • Teflon Products • Packings • Sintered Metal Parts • Bowling Balls

Yes! MERRICK FEEDOWEIGHTS Are Specified by More and More Cement Companies



BECAUSE ACCURATE FEED CONTROL

by weight means accurate proportioning of raw mix components as well as Clinker and Gypsum. Specifying MERRICK equipment assures greater product uniformity.

We are pleased to add the Superior Cement Mills plant of New York Coal Sales Company at Superior, Ohio, with six new FEEDOWEIGHTS* to our growing list of FEEDOWEIGHT users.

MERRICK also makes the WEIGHTOMETER* for automatically and continuously weighing materials in transit on belt conveyors.

We solicit your inquiries. Bulletins 551 and 375 available on request.

*Reg. U. S. Patent Office.

MERRICK SCALE MFG. CO.
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Pulverizers

Have you investigated our new
BRADLEY HERCULES MILL?
Unquestionably the last word in
Economy and Simplicity.
(Send for New Catalog No. 59)

BRADLEY PULVERIZER CO.
ALLENTOWN, PENNA.

to 6 in. The crushed stone is moved by belt conveyor to a primary screening tower where the minus $\frac{3}{4}$ -in. (or $\frac{1}{2}$ in.), depending on the weather, is rejected and sent by belt conveyor to a dump, well up the side of the hills. The screen is a 5- x 12-ft. Tyrock double-deck screen with a wear-taking upper deck having a 2 $\frac{1}{2}$ -in. opening. All plus fractions are conveyed about 3600 ft. on a 30-in. field belt conveyor to the surge pile ahead of the preliminary washing and heavy media separation plant.

Frank M. Cashin is manager of the Chemical Division of Kaiser Aluminum and Chemical Corp., with J. F. Knight as area manager. D. M. Kerr is area superintendent and Dr. A. C. Byrns, director of research. J. D. Moore is plant superintendent; H. C. DeVries, chemist; H. Bolan, production supervisor; Clyde Garman, H.M.S. metallurgist and efficiency engineer; R. H. Beggs, geologist; and Henry Mathes, maintenance superintendent.

Blasting

(Continued from page 146)

drills or shovels are below the shot and all powder is kept back from the hole, then carried one stick at a time to the hole for loading.

"One is not able to judge good shooting by simply looking at a shot after firing. The loading, crushing and amount of the finest product is your answer. The only way to arrive at either good or bad results is with records and a very close study."

Solid Dolomitic Limestone—(40)

This quarry in Ohio is in a solid formation. Face height averages 78 ft., and the spacing of drill holes is 29 ft. with 15-ft. burden. Eight holes fired in a single row, progressively, give best results. They are fired by American delayed action electric caps (7 delays, A-B-C-D-E-F-G) with bottom detonation and using primacord up from the bottom to the deck. Drilling is carried 8 ft. below the floor for an 80-ft. face. Primacord delays are used for secondary blasting.

Powder factor is the same and better breakage has resulted, with less vibration and better control of throw. No trouble has been experienced from misfires, and the seismograph and services of outside experts have been used only twice over a 10-yr. period.

Limestone of Variable Hardness—(41)

"The area from which we are obtaining our limestone is close to the top of a mountain, 3200 ft. in elevation and about one mile from the nearest habitations. The stone is moderately soft with some harder and some softer patches in it. The average inclination of the loosely attached strata and laminations is 26 deg.

(Continued on page 156)

APPROVED

in
PUNISHING SERVICE
*...by More Plants for
More Kilns*

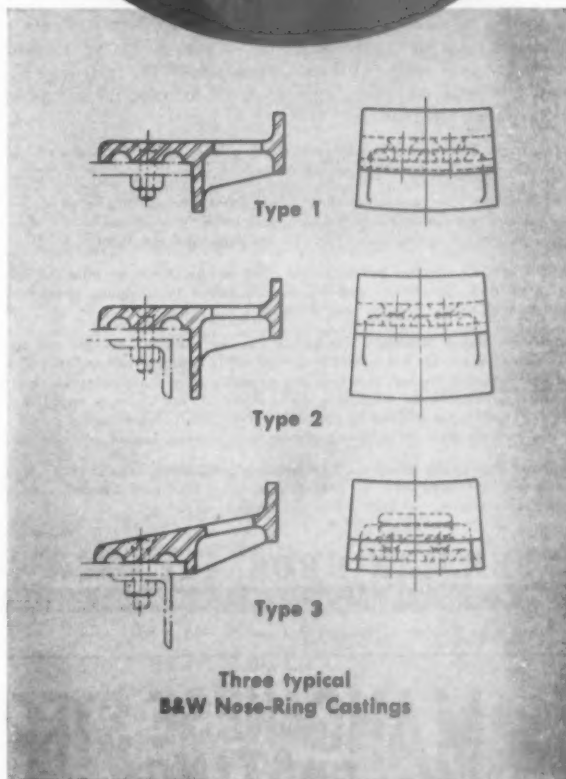


B&W ALLOY NOSE-RING CASTINGS are establishing a record of fast-growing acceptance by cement plants across the country and abroad. Recent installations have increased the total to 189 sets—or 7062 pieces—now in operation on the discharge end of rotary kilns in leading cement, lime, and dolomite plants.

Sparking this acceptance trend are important cost-saving features characteristic of these light and strong B&W Castings, resulting in improved kiln performance. These features include:

- Longer brick life and continuous operation by elimination of kiln shell "belling."
- "Feathering-down" of end of kiln shell due to oxidation is overcome, since shell is protected from direct flame.
- Low installation cost, due to small size and light weight of B&W Castings.
- Protective flange on casting permits use of low-alloy steel bolts.
- Spare part inventory reduced as same casting will fit kilns varying up to two feet in diameter.

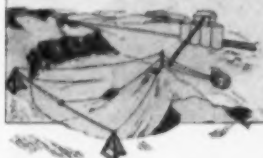
*Write for Bulletin SDM-12.
The Babcock & Wilcox Company,
Process Equipment Dept.,
Barberton, Ohio.*



**BABCOCK
& WILCOX**

ONE MAN CONTROL

DIGGING • HAULING
AUTOMATIC DUMPING



The gravel operation at right is one of three modern plants at different sites, producing about 500,000 tons of concrete aggregate annually for a large Ohio firm, and all depending solely on Sauerman Rapid-Shifting Scraper Machines to dig and move their material. The machine in the picture uses a 3-cu. yd. Sauerman Crescent bucket operating on a 350-ft. span. It has dug a sizable pit down to the water level and will extend the pit in two directions, besides continuing under water to the full depth of the deposit.



SAUERMAN EARTHMOVERS

Labor saving efficiency . . . low initial cost . . . rugged digging and hauling power . . . all-around versatility . . . and moderate power requirements . . . are distinct advantages that have made Sauerman Earthmoving Machines famous for over forty years. Sauerman Machines spot and dump automatically under the easy control of an operator situated in a comfortable cab overlooking the work area.

Drag Scraper Excavator: Combines digging power, hauling speed and long reach for efficient pit or hill excavation, reclamation and handling of materials, wet or dry.

Slackline Cableway Excavator: Unequaled for operations that require deep digging, especially under water, and delivery to a high point. Reaches hundreds of feet into ponds, wet pits, sludge basins and similar areas, while operator remains in a safe spot.

Mobile Tower Excavator: Self-propelled drag scraper machine, affording great digging capacity, long reach and exceptional mobility. Ideally suited to stripping operations, pit excavation, re-handling mine waste and for stockpiling.

Scrapers on Boom Machines: Sauerman Crescent Scraper buckets are invaluable as auxiliary digging equipment for boom machines. Use of a Crescent bottomless bucket in place of a conventional dragline bucket increases the capacity of a boom machine on work where material has to be moved but not lifted. Any given size and type of boom machine will handle a Crescent of much larger capacity than its ordinary bucket. This combination of boom machine and Crescent bucket is widely used for scraping gravel to a hopper, backfilling, and cut-and-fill jobs.

Sauerman also builds scraper-stackpilers, scraper-loaders, power rakes and related equipment. For full information send for illustrated, descriptive literature. Consult our engineers for assistance in your earthmoving or bulk materials-handling problems.

SAUERMAN BROS., INC. 530 S. CLINTON CHICAGO 7, ILLINOIS

ENGINEERS AND MANUFACTURERS • SCRAPERS and CABLEWAYS SINCE 1909

MANGANESE STEEL CASTINGS

for
PULVERIZERS
CRUSHERS
ROLLS
SCREENS



for
SHOVELS
DREDGES
CRANES
CONVEYORS

The Frog, Switch & Mfg. Co.

Established 1881

CARLISLE, PA.

"We have drilled and blasted in this area at right angles to the strata and from in front of the lower edge of them. The results from each method are identical. We therefore choose the easiest physical approach, that being the latter method.

"We aim to carry a face of 100 ft. or thereabouts. In the interests of safer operating conditions we try not to exceed that. After much experimentation we have adopted a pattern of 100-ft. holes, 8-in. diameter, a burden of 26 ft. and spaced 25 ft. apart in a single row. We are able to get from 1800 to 2000 lb. of powder in each of these holes. The sizes of blasts have gradually been increased from six holes to twelve holes with only a slight increase in vibration.

"The size of our primary crushing plant and the necessary tonnage required per day makes it imperative that we get an unusually high degree of fragmentation.

"We are blasting from the center of a through-cut, both ends being tight, the lead-off hole sometimes being in the center, sometimes to within one hole from either corner. Prior to commencement of loading, a cross section is made of each hole and a loading chart made after giving due consideration to visible strata, open laminations, small caves, mud seams, major fractures and measured burden. The usual pattern per hole is 8 ft. of 75 percent powder in 50-lb. sticks at the bottom, 12 ft. of 60 percent powder in 50-lb. sticks following. Primacord is attached by three half hitches to the first cartridge lowered into the bottom of the hole. The hole is loaded solid to within 25 ft. of the surface, unless the load chart has shown the need to deck load due to weak spots in the face. When all loading has been completed, milli-second delay blasting caps with colored leg wires are made up with pig tails and at the last possible moment attached to each hole, the reason for this being the high frequency of lightning strikes in this area. A zero is attached to the lead-off hole and then a .025-milli-second interval cap to the adjacent holes on each side. In progressive order, caps are placed at each hole, the same .025-milli-second interval being used from center to corners. The blast is initiated by a manually operated blasting battery in a shelter 1000 ft. to the rear of and to one side of the shot.

"We have never been able to eliminate toes, but experimentation with spacing, timing and size of hole has reduced it to scattered toes 2 to 3 ft. high mostly between holes. We attribute the toes to inability to obtain drill holes closer to the face, due to back break of loose laminated surface and to all holes not giving their maximum force in the right direction because of faults, fractures and soft spots. Corner holes do well and seldom have toes or produce excessively bad breakage or have any more back break than other holes.

Up steep hills—on loose gravel and sand piles
over sharp rocks—slush, mud, gravel—out and over
the highway **GENERALS** deliver more loads

Faster! Easier! At Lower Cost!



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GENERAL
L.C.M.**

**THE
GENERAL
H.C.T.**

GENERAL L. C. M.—for most work off-the-road. Massive tread and thick, tough shoulders develop extra traction. Extra wear on tough, jagged surfaces. Stronger rayon cord body with more natural rubber built into its shock-absorber design.

GENERAL H. C. T.—for more work on-the-road. Thick, saw-tooth tread supported by broad, angled shoulder cleats develop extra traction. Smoother rolling, quicker stopping. More original and more recap miles.

Make Every Worn Tire Work Longer for More Profit!

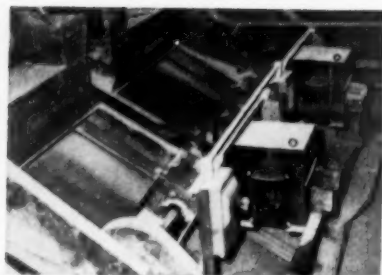
Your GENERAL TIRE DEALER will KRAFT SYSTEM RECAP Worn Tires with the New GENERAL Truck Tire Tread of Your Choice

You're throwing away money when you throw away worn tires or accept an ordinary "adjustment" for them. Let your General Tire Dealer—a tire expert—restore worn tires with famous factory controlled Kraft System Recap-

ping. You choose from the complete line of on and off-the-road new General Tire treads and he'll put that tread on your worn tire. He can do sectional repairs too. Get Kraft System Recapping—get more profit from every tire.



SPECIFY GENERAL TIRES ON YOUR NEW EQUIPMENT



WIDE OPEN for FULL CAPACITY Production on Troublesome Fine Screening

Notice the difference between the two screens in the untouched photograph above. Even in these small views you see the glazing over of the mesh by damp fines on the front screen while the rear screen is wide open.

FlexElex electric heating of jackets makes the difference. Both screens were started at the same time. After only ten minutes the initial build-up of damp fines is plainly visible on the unheated screen. Eventually this leads to costly, time-consuming blinding and substantial production loss.

For days of full capacity operation, install new Leahy Screens equipped with FlexElex, the electric heating arrangement that pays for itself in months . . . and continues to pay increased profits.

Send for Bulletin 15-J (Note: Owners of old Leahy Screens may order FlexElex to fit.)

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CONCENTRATOR
COMPANY**

The Original Deister Company, Incorporated 1906

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PRODUCTS**

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EXPLOSIVES USERS—If you are experiencing or anticipate legal or public relations problems arising from blasting effects—

Send For Our **BROCHURE** Describing Our Services

**"VIBRATION PROBLEMS CONNECTED WITH BLASTING: THEIR
SOLUTION AND CONTROL BY SCIENTIFIC METHODS"**

(Price Schedule Accompanies Brochure)

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131 N. WYOMING ST.

PHONE 5774

HAZLETON, PA.

Will soon have a representative in Joplin, Missouri

"Misfires due to cut-offs occurred when the spacing was too close—21 ft. Shorter interval delays did not cure this so we settled on a longer spacing until it was eliminated.

"In our experience milli-second delay blasting has been an improvement on the instantaneous method. Primary powder costs are about the same, secondary powder and labor about 25 percent less each. We are now able to move the shovel in and start digging with much less delay. The greatest benefit is shown in increased volume obtained from all equipment with lower maintenance due to better fragmentation and controlled location of the stone pile in the quarry.

"We hopefully look forward to the solution of many of our problems through an interchange of ideas with those who also have problems similar to ours. What is the magic formula we are looking for that will give us the desired fragmentation, the reduction of back break and no more toes? What is the ideal spacing, burden, height of face, interval of delay, speed of powder, number of holes and method of initiation of blast and why does it work?"

Hard Limestone—(42)

This cement plant quarry in the South has a deposit consisting of approximately 37 ft. of limestone with overlying stratified layers of Fullers Earth and cap rock. The limestone is fairly hard.

The height of face is 44 to 48 ft. and general practice is to fire 65 holes per shot in a double row, with 32 holes in the front row and 33 in the second row. Spacing is 22 ft. for all holes and the burden is 14 ft. for the front row and 12 ft. for the back row.

Electric caps are used as most convenient for bottom detonation which has given best results. Delay periods are in intervals of 25 milliseconds. Bottom hole initiation has been found to prevent spouting from the top of the holes, to minimize backbreak, eliminates heavy toe or high bottom and gives best fragmentation. Alternate shooting of holes has been found to give better fragmentation than sequence firing.

Secondary blasting has been markedly reduced with millisecond delays but powder factor has been increased from .05-.10 tons of rock per lb. of powder. Principal benefits derived have been in reduced secondary blasting and in savings from reduced equipment maintenance.

Deck charges are not used but solid column loading and no difficulties have been experienced with cut-offs or misfires. Extraneous currents are guarded against by checking the lead lines for stray currents. Seismographs are not used but all primary shots are made using the services of powder company representatives.

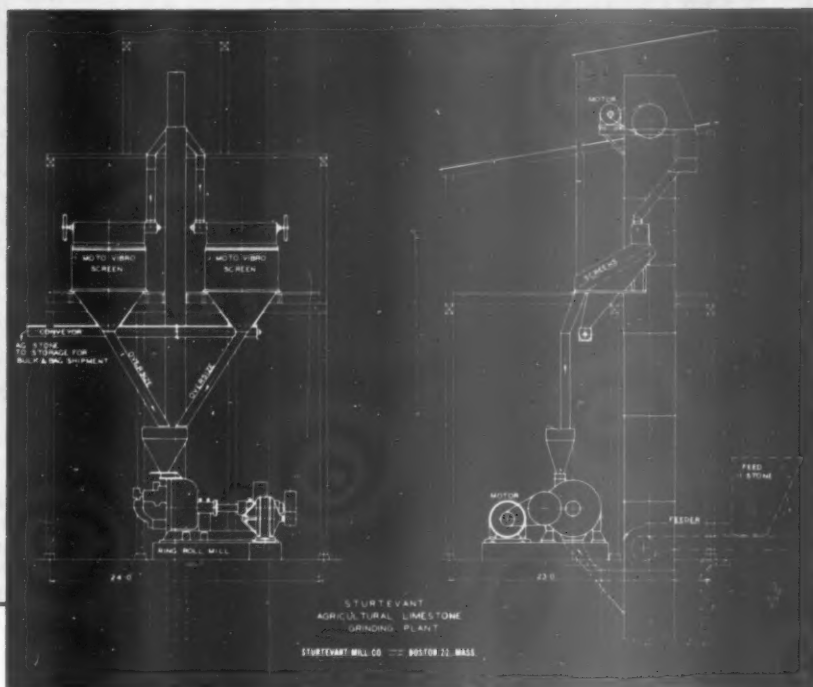
Laminated Cement Rock—(43)

This deposit is a laminated near-horizontal structures with a face

STURTEVANT RING ROLL MILLS

GIVE YOU

*Finer
Grinding
of
AG-LIME*



You Get . . .

HIGH TONNAGE

Use Less HP Per Ton . . .

Lower Maintenance Cost

Sturtevant Ring Roll Mills provide the solution to fine grinding of agricultural limestone which is taking the place of the coarser mesh previously made.

These rugged, dependable mills overcome the disadvantages of hammer mills, which cannot be closed up enough to get the required fineness.

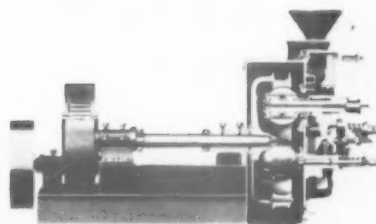
The Ring Roll Mills give you more over-all fineness, more flour than possible by any other grinding method. Maintenance costs are cut to the bone especially where silica is present which quickly wears down hammer mills.

Investigate Sturtevant Ring Roll Mills and screens today. Find out how you can increase tonnage, reduce cost of grinding fine ag-lime. Write for information.

STURTEVANT MILL COMPANY

102 CLAYTON STREET

BOSTON 22, MASSACHUSETTS



RING ROLL MILL

for fine reduction of ag-lime (4 to 20 mesh). Open-door accessibility for easy cleaning. Available in many sizes and capacities.



MOTO-VIBRO SCREENS

models with or without feeders. Many types and sizes . . . screens from 1/2" to 60 mesh.

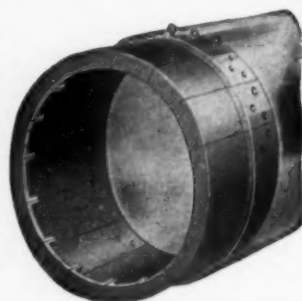
PYRASTEEL

SEGMENTAL KILN ENDS FOR CEMENT PLANTS

... proven satisfactory in THOUSANDS of Installations

Avoid burnouts and shutdowns, and insure years of continuous service, by equipping your kilns, both feed and discharge ends, with PYRASTEEL Segmental Kiln Ends. PYRASTEEL is equally effective and economical in many other high-heat applications, including clinker coolers, conveyor screws, feed pipes, and drag chains. Over three-quarters of the annual cement output is produced in plants using either or both of our alloys, PYRASTEEL and EVANSTEEL.

Unit Segments are easy to install or replace



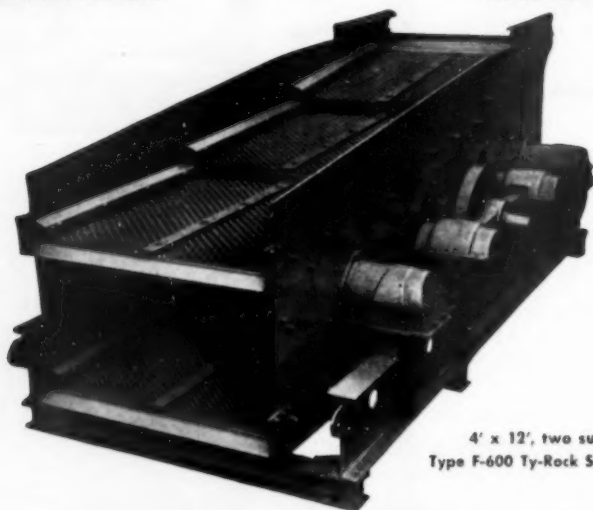
**PYRASTEEL
KILN END,
Discharge end**

Write for PYRASTEEL Bulletin

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4' x 12', two surface
Type F-600 Ty-Rock Screen

THE W. S. TYLER COMPANY

CLEVELAND 14, OHIO

Manufacturers of Woven Wire Screens and Screening Machinery

height from 100 to 200 ft. From 5 to 8 holes are fired per shot, progressively, using both electric caps and blasting switches. Electric caps are preferred. The delay period with caps is in 25-millisecond intervals and, for the switch, in 20 millisecond intervals. Detonation is initiated from the top of the holes for reasons of safety.

Toes are minimized by cleaning up all rock before blasting and by drilling 4 ft. below the quarry floor. Powder factor is about the same as for instantaneous shooting but vibration is much less and control of throw improved. Backbreak, however, has been increased. No difficulties have been experienced from cut-offs or misfires although there have been some mechanical difficulties with timing switches. The services of powder company engineers are used for primary shots.

N.A.L.I. Convention

(Continued from page 150)

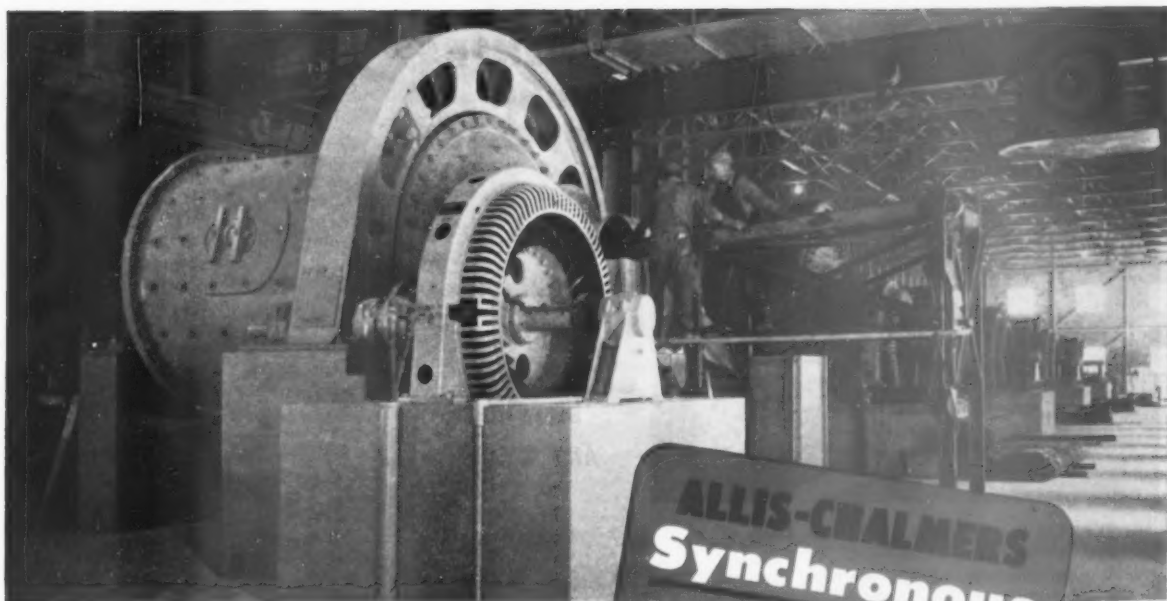
usable for the extraction of aluminum and also as an abrasive as mined. The thinking is now to permit the higher depletion in the metal classification for the proportion used in aluminum production and the lower rate on the proportion mined for use as an abrasive.

The revenue department takes the position now that end use must be followed in determining the percentage depletion for metallurgical and chemical limestone, rather than chemical classification; otherwise the many variables would necessitate that all limestones qualify for the higher 15 percent rate. As far as agstone is concerned, the impression was given that it should be included in the CaCO_3 classification (10 percent) rather than in the stone category which is entitled to only 5 percent.

Mr. Williams discussed the maze of problems inherent in the 50-mile maximum permissible distance between mine and mill, and in the determination of "gross income" from a property. The question is what costs are to be included in the mining processes. It's a case of trying to fit limestone into terminology in the law that was originally written for metal processing and to determine what constitutes ordinary treatment processes. Does it include processing through sorting, concentration and loading or is the cut-off point after grinding, etc.?

Horace Krause, Columbia Quarry Co., St. Louis Mo., chairman of the percentage depletion committee, concluded the session with a very informative interpretation in submitting his report of activities.

First, he said that any owner or operator of a property, or operator leasing a property is entitled to percentage depletion. The taking of cost depletion is recommended where a property is losing money and percentage depletion is to be taken for profit.



Midwestern installation of five Allis-Chalmers 9 x 12 rod mills and 450-hp, 100% pf, 440-volt, 257-rpm, pedestal bearing synchronous motors.

Built for a Long Grind

*Here are three reasons
why Allis-Chalmers
grinding mill motors
help keep your mills
grinding economically
year after year:*

Each motor is engineered for its job. A-C's half century of experience building electrical equipment and processing machinery assures torque and other operating characteristics tailored to the individual installation requirements.

Time-proved basic design features contribute to long life and trouble-free operation. These are described in Bulletin 05B7648.

Adequate manufacturing, inspection and testing facilities insure that each motor will be built exactly as specified.

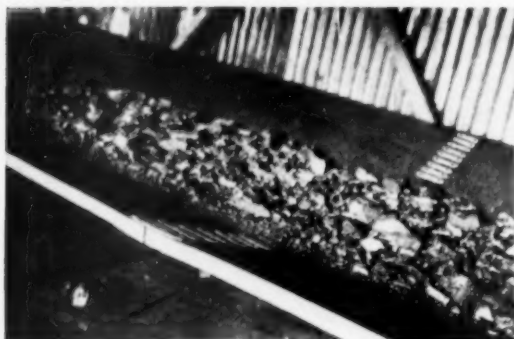
For more information on motors that minimize maintenance and down-time, call in your A-C representative, or write for illustrated Bulletin 05B7648. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3946

ALLIS-CHALMERS



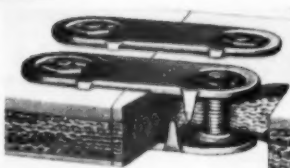
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FOR HEAVY
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- ★ FLEXCO Fasteners make tight butt joints of great strength and durability.
- ★ Trough naturally, operate smoothly through take-up pulleys.
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- ★ Made of Steel, Monel, Stainless, Everdur. Also Promal top plates.
- ★ FLEXCO Rip Plates are for bridging soft spots and FLEXCO Fasteners for patching or joining clean straight rips.

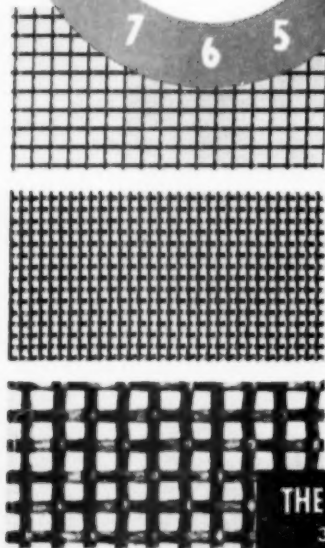


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FLEXIBLE STEEL LACING CO., 4684 Lexington St., Chicago 44, Ill.

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Write for Bulletin No. 5 and 6.

THE CLEVELAND WIRE CLOTH & MFG. CO.
3574 E. 79 STREET • CLEVELAND 5, OHIO

able operations. Evidence of ownership or lease arrangements should be filed with the tax return when percentage depletion is taken or, if not done, an amended return should be filed.

After percentage depletion was incorporated into law, the association through its committee cooperated with the revenue department in filing a statement of process steps and background information on the various classifications of stone as to their relationship to the 5, 10 and 15 percent brackets, also proof was filed on agstone being of chemical grade. The revenue department, at the time, was of the opinion that the agstone industry was entitled to 10 percent depletion and not the 15 percent rate it is seeking.

One of the accomplishments has been to straighten out the discrimination that existed against fiscal year companies compared to those on a calendar year basis. The committee took exception to the new rules as published in the Federal Register, October 25, 1952, and believes that some headway was made for relief of the industry. When the final rules are adopted the next recourse, said Mr. Krause, will be through an actual tax court case that will have to be fought by an individual producer. Legal counsel has been engaged by the association to interpret the final rules and to follow future tax suits and report to the association. In conclusion, Mr. Krause expressed his appreciation to those who worked so diligently in helping the committee and said that the industry feels that the industry should take 15 percent percentage depletion.

Agricultural Aims

Charles Coburn, Waukesha Lime and Stone Co., Waukesha, Wis., presided for a luncheon at which H. L. Manwaring, U.S.D.A., spoke on the subject of the agricultural job to be done. The goals set by the U.S.D.A. call for all-out production of specific agricultural products as contrasted to the aim of all-out production of everything a year ago. For example, it is desired to have less acreage in corn than a year ago but with increased yield per acre for a total



Left to right: Treasurer Alvin R. Armbrust, Washington, C. H., Ohio, with president K. K. Kinsey



How's your tonnage ?

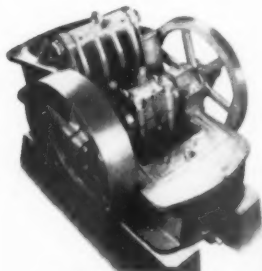
Is your volume holding up . . . with profits getting leaner? If so, you can do one of two things: Get more business . . . or pull in your belt. Added business is not always easy to find. But, production economies are with Traylor Curved Crushing surfaces. Here's how Traylor Curved Jaw Plates reduced operating costs by 58% for one of our customers. His straight jaw plate crusher required 12 hours to reduce 53 tons of rock. The same crusher . . . at the same setting and with the same stone . . . stepped up production to 53 tons in just 5 hours after being fitted with Traylor Curved Jaw Plates. For every ton per hour crushed with straight plates, 2.4 tons were crushed with Traylor Curved Plates Result: Operating costs per ton cut 58%. Traylor Crushers offer this operating economy at every stage of reduction. Mail the coupon and get the facts about real crushing efficiency for both primary and secondary reduction.



TRAYLOR TC Gyratory Crusher. Capacities range from 155 to 2860 tons/hour.



TRAYLOR TY Reduction Crusher. A perfect example of compact, simple design.



FOURTEEN Traylor Type H and HB Jaw Crushers offer a wide range of sizes with feed openings from 8" x 12" to 56" x 72".

Traylor's complete line of crushers apply the operating economy of curved crushing surfaces at every stage of reduction.

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Send complete information on the Traylor
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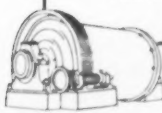
Primary Gyratory Crushers



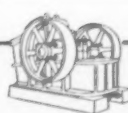
Rotary Kilns



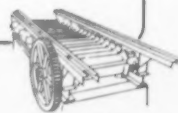
Secondary Gyratory Crushers



Ball Mills



Jaw Crushers



Apron Feeders

Macwhyte 6x25F PRE-
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Rope with
I.W.R.C.



How many moving parts?

In this particular rope construction, there are 199 individual wires. Each is a carefully designed "moving part."

To assure highest quality, all stages of wire manufacture and rope fabrication are closely controlled. Each wire is protected with a film of lubricant that is force-fed cold during the fabricating. May our engineers recommend the right rope for your equipment?

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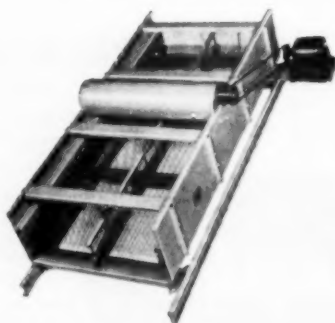
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Whether your plant capacity is 10 or 1000 tons per day, **UNIVERSALS** are ideal to standardize on. They're rugged, simple in design and flexible in handling stone, sand and gravel with equal efficiency.



Type "C" 3' x 5' single-deck



Type "MR" 3 1/2' x 8' double-deck

Prices and delivery on these dependable Screens will surprise you. Write for new Bulletin No. 125 on latest models today!

UNIVERSAL VIBRATING SCREEN CO.

RACINE — WISCONSIN

just as large. Requirement is for an abundant and uniform farm production to permit better living by a population that will have been increased by six million people in the next three years.

The requirements for food will be up 40 percent over 1939 consumption within the next three years and an attempt is to be made to build reserves in the soil itself. Mr. Manwaring touched upon the SCP appropriations which have been recommended to stay at the \$250 annual figure for both 1953 and 1954 and about which there is much speculation. As far as liming is concerned, he said that the use is less than one-half of the amount needed annually for soil maintenance only, let alone restore soil fertility to normal.

Entertainment

In addition to the regular sessions, there were two luncheons, a cocktail party and buffet supper and the annual banquet.

Russell W. Hunt, Southwest Lime Co., Neosho, Mo., presided over a luncheon at which Edward McFaul, one of the nation's outstanding dinner speakers, spoke on the subject "How Confused Can You Get?". Mr. McFaul's talk was crammed full of amusing stories which provoked a great deal of laughter. It covered the five fears which are dramatized by newspaper headlines, advertising and other media, they being lack of faith, loneliness, little things, illness and old age. Apparently a good way to get rid of these fears is to listen to Mr. McFaul's stories or think back at them.

President Robert Patton presided over the annual banquet which had an attendance in excess of 150 congressional guests, many of whom he introduced. Senator Wayne A. Morse of Oregon was the after-dinner speaker on the subject "National Defense in Our Soil".

Senator Morse may be a highly controversial figure in Washington, but there was no doubt where he stands on the importance of a sound agriculture and in his appreciation of liming and other soil conservation practices.

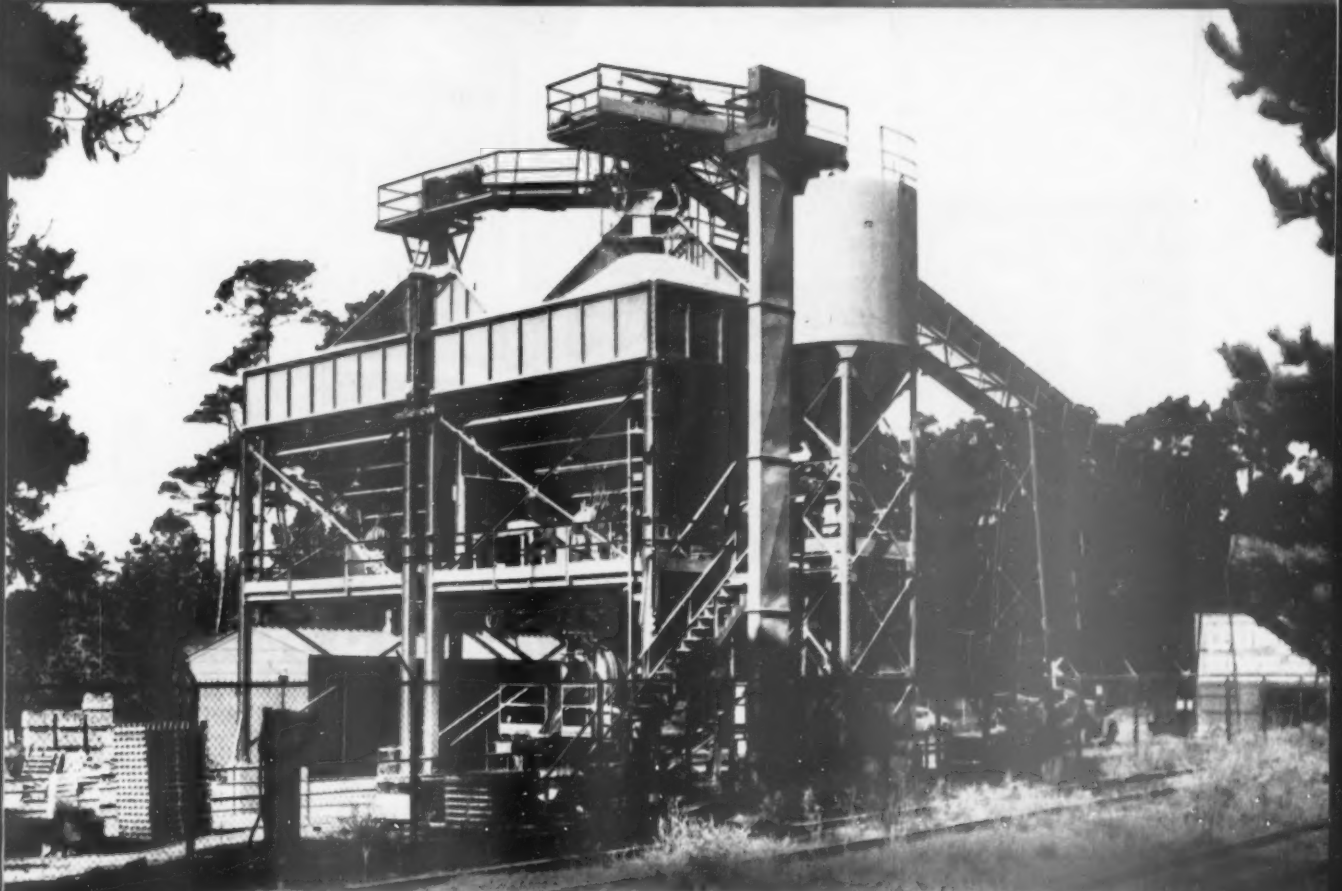


President-elect K. K. Kinsey, left with Earl L. Heckathorn, Stuntz Yeoman Co., Delphi, Ind., member of the executive committee

CONCRETE PRODUCTS

A SECTION OF ROCK PRODUCTS

CONCRETE UNITS · READY-MIXED CONCRETE



Batching plant of Central Supply Co., at Pacific Grove, Calif.

The "King" RULES



"because it's RIGHT!"

Yes, the GOCORP "King" is tops in each area in which it operates. That's because the blocks it makes are so superior, and are produced at a cost less than ordinary blocks. Here's a machine that represents the best and latest thinking of men with a lifetime of experience in this field. Block plant owners who have investigated, like the owner of this typical "King" operation, recognize these advantages GOCORP offers:

- Hydraulic "sequence operation"—for high quality blocks, low maintenance.
- Vibrating mold filled directly from main supply hopper—no feed drawer.
- Intense vertical vibration, combined with pallet-to-mold clamping, assures compact, uniform units.

● "Tomorrow's machine today" — removes obsolescence risk.

These are only a few reasons why the GOCORP "King" rules. If you want three or four cycles per minute—six blocks per cycle—with one operator—simultaneous production of two sizes, if desired—write for further details on the "King" and name of our representative near you.



INDUSTRY NEWS

Research Laboratory

BUILDERS SUPPLY CORP., Phoenix, Ariz., recently announced the completion of its new testing and research laboratory at its Phoenix plant. Dr.



George G. Olson, research director

George G. Olson has been appointed director of research of the new laboratory, assisted by Eugene Crile.

Dr. Olson, who was a diesel engineering officer in the Navy during World War II, holds a Doctor of Philosophy degree in physical chemistry from the University of Colorado. His last year at the university was spent as the recipient of the Du Pont Fellowship in chemistry, for the year 1950-1951. Other previous research experience includes his employment as a research chemist on projects at the University of Colorado, sponsored by Research Corp. of New York; and research work for the Office of Naval Research and for the Atomic Energy Commission.

A number of new products are in various stages of development at the new laboratory, with principal research being in the field of lightweight concrete.

Bright Outlook for Precast Concrete

ROGER H. CORRETTA, in a speech entitled "Brick and Plaster Are on the Way Out," presented before the Concrete Industry Board, of which he is chairman, said that precast concrete units will supplant brick and plaster in building construction within the next 25 years.

"The mounting costs of brick and plaster and the many problems encountered in building with these methods are causing many engineers and architects to seek other mediums of construction," he said. He predicted

that the answer will be found in precast concrete units, including complete wall sections, which can be fabricated in any shape, size and color and be effectively insulated.

Eight or nine men can erect as many square feet of precast wall in one day as it would take 50 bricklayers and 40 laborers to put up using brick and mortar. He also emphasized that developments in prestressed concrete units will make it possible to produce thinner and lighter units.

Concrete Masonry Tests

NATIONAL CONCRETE MASONRY ASSOCIATION recently issued, in booklet form, Technical Report No. 38, on "Rate of Moisture Loss From Steam Cured Concrete Masonry Units With Natural Air Drying, Under Cover." Besides the introduction, subjects covered in the report are: Purpose and General Outline of Tests; Test Procedure; Determination of Total Absorption; Basis for Calculation of Moisture Contents; Free Drying Specimens; Discussion of Results; General Comments; and General Application of Results. Also included are several illustrations, charts and drawings.

Site-Cast Concrete Pipe

UNIVERSAL CONCRETE PIPE CO., Columbus, Ohio, has published a new brochure entitled, "Large Diameter Pipe Made at the Site," which tells how the company ships mobile equipment and key personnel to large projects, where local labor and materials are used to produce large-diameter and long-length reinforced concrete pipe. Chief advantages listed for the site-cast pipe are saving of time and money and prevention of shipping damage.

New Roof System

CONCRETE PRODUCTS, INC., Brunswick, Ga., has developed a building material called Porex soffit slabs. The material, a shaped roof slab made of mineralized wood fiber bound together with portland cement, is used as a permanent form for reinforced concrete roofs and floors. The slabs remain in the completed structure to become an acoustical, flush ceiling, offering insulation to heat and cold and control of sound transmission.

Cover Picture

ONE OF THE MOST MODERN of the four ready-mixed concrete plants of Central Supply Co., Watsonville, Calif., is at Pacific Grove. All the plants are central-mix for better slump control, using weigh batchers and 1-cu. yd. mixers. The Pacific Grove plant is of all-steel construction.

PRUITT CONCRETE CO., Big Spring, Texas, which opened a ready-mixed concrete plant about a year ago, has expanded operations by the addition of three 3-cu. yd. transit mixers, increasing to five the total number of transit-mixer trucks. Andy Pruitt and W. R. Hall are the owners and operators.

THE GICHNER BUILDING AND SUPPLY CO., INC., Bowie, Md., whose plant was largely destroyed by fire last November, has announced that it plans to discontinue the manufacture of sand-lime brick, but will continue its production of pastel brick, a colored slump brick product.

EVER-READY MIX CONCRETE has established a new plant at Bettendorf, Iowa. In addition to ready-mixed concrete, the firm will supply sand, gravel and other building materials. Jack Mangelsdorf is president and F. J. Wood is vice-president and general manager.

HOVEY CONCRETE CO., Santa Fe, N.M., was recently presented a safety award by U.S. Fidelity and Guaranty Co., in recognition of its two years of operation without a lost-time accident. William B. Hovey is president of the company.

CONCRETE PRODUCTS & MATERIALS Co. and Douglas County Gravel Co., Omaha, Neb., have been sold to Ready-Mixed Concrete Co. and Lyman-Richey Sand & Gravel Corp., Omaha, both headed by Fred P. Curtis.

MILLER BLOCK AND SUPPLY CO. recently installed a second Columbia block machine (Model No. 8) and block splitter at its Lawrenceburg, Ind., plant. The initial installation was made about a year ago.

MCCAMEY CONCRETE CO. recently began operation of its new plant at McCamey, Texas. In addition to ready-mixed concrete, the firm also deals in sand, gravel and plaster.

W. E. TINDEL AND SON, Melvin Tindel, have established a ready-mixed concrete plant at Hydro, Okla. Equipment includes a batching plant and two transit-mixer trucks.

THE CONCRETE BLOCK PLANT of Caspian Lumber and Coal Co., Stambaugh, Mich., was recently destroyed by fire, at a loss of approximately \$75,000.

A READY-MIXED CONCRET PLANT has been established in Pratt, Kan., by Vic and June E. Baum, Great Bend, Kan. Plant equipment includes four transit-mixer trucks.

HOVEY CONCRETE PRODUCTS, Santa Fe, N.M., has been granted a \$70,000 loan from the Reconstruction Finance Corp.

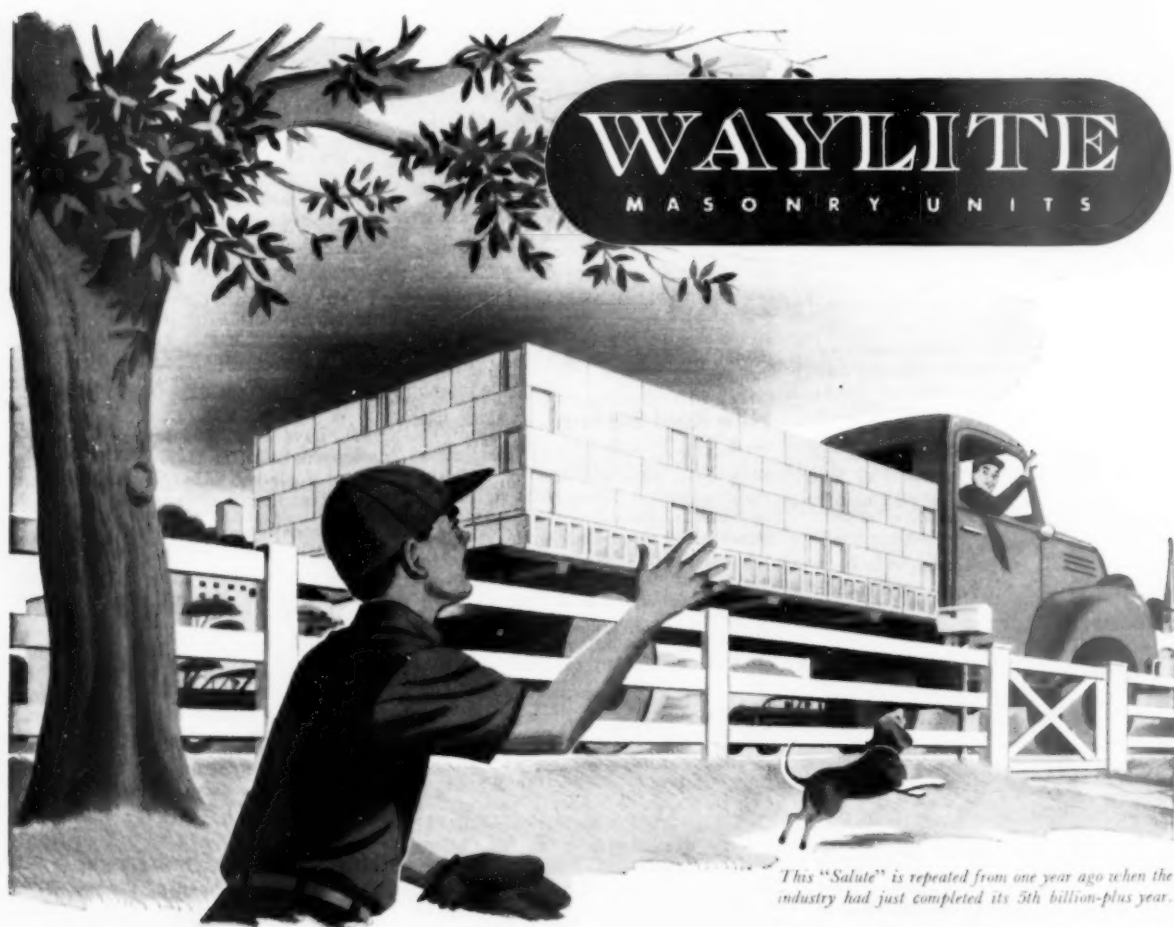
A NEW CONCRETE BATCHING PLANT has been established at Walton Hills, Ohio, by Carr Brothers Builders Supply and Coal Co., Bedford, Ohio.

A SALUTE TO THE

Concrete Masonry Industry

ON ITS SIXTH SUCCESSIVE BILLION-PLUS YEAR

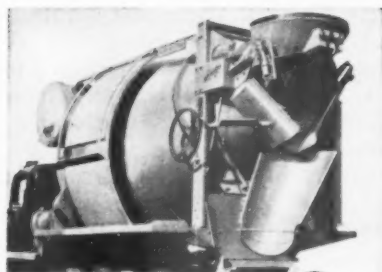
The remarkable record of the Concrete Masonry Industry during the past six years in producing the equivalent of over Six Billion sq. ft. of 8" Masonry Wall Units has few parallels in building industry history. . . . This production has been equal to about two-thirds of all masonry walls built in the United States during this period. . . . This unprecedented growth of the Concrete Masonry Industry has been the direct result of the quality, utility and economy of concrete masonry walls, and the superior service of progressive locally-owned companies. . . . The Waylite Company is proud to be a part of such an outstanding industry in the construction field, and this seemed to be a good time to say so. . . .



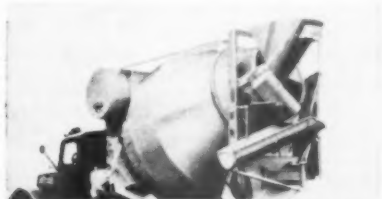
This "Salute" is repeated from one year ago when the industry had just completed its 5th billion-plus year.



Get greater payload capacity with Worthington Hi-Ups



MODEL LC—standard equipment: top hatch loading door, closed end charging door, running boards, side shields. Approximate weight—7100 lbs.



MODEL LO—standard equipment: open end drum with fixed hopper, inspection plate, no side shields or running boards. Approximate weight—6300 lbs.

In Worthington Truck Mixers, engineered weight distribution brings the center of gravity well forward of the rear axle—enabling you to carry the maximum legal payload. Scale weight is held to a minimum, with no sacrifice in strength or operating efficiency.

Rigid factory and field tests assure each Blue Brute user of trouble-free operation and low cost maintenance. All parts requiring attention are readily accessible for easy servicing.

The modern Worthington mixer is available in capacities of 3, 4½ and 5½ cubic yards, with respective agitator ratings of 4¼, 6¼ and 7¾ cubic yards.

Learn more about the Blue Brute Hi-Up—the truck mixer that is the ideal combination of light weight, strength and durability. Get in touch with your nearest Worthington Blue Brute distributor or write Worthington Corporation, Construction Equipment Division, Plainfield, N. J.

R-3-1



If It's A Construction Job, It's A **BLUE BRUTE** Job



PRODUCTION TESTED! Blockmaster[#]3

High Production • Fully Automatic • Hydraulically Powered



The Multico Blockmaster No. 3 is now ready for *your* plant—after three years of production testing in many plants. Producing three blocks per cycle, it is a completely automatic machine, requiring labor only to off-bear block. Hydraulic power from a separate unit provides smooth, quiet operation and serves additional machines in future expansion. The compression action combines pressure, vibration, and tamping, for perfect blocks. Plain pallets are used in making any size or style of block with any aggregate.

Both the Blockmaster No. 3 and the newly modified No. 2 have 50% less moving parts than any other machine in their capacity classes. This means an absolute minimum of maintenance. Make this proven Blockmaster No. 3 your next machine; call or write for further information.

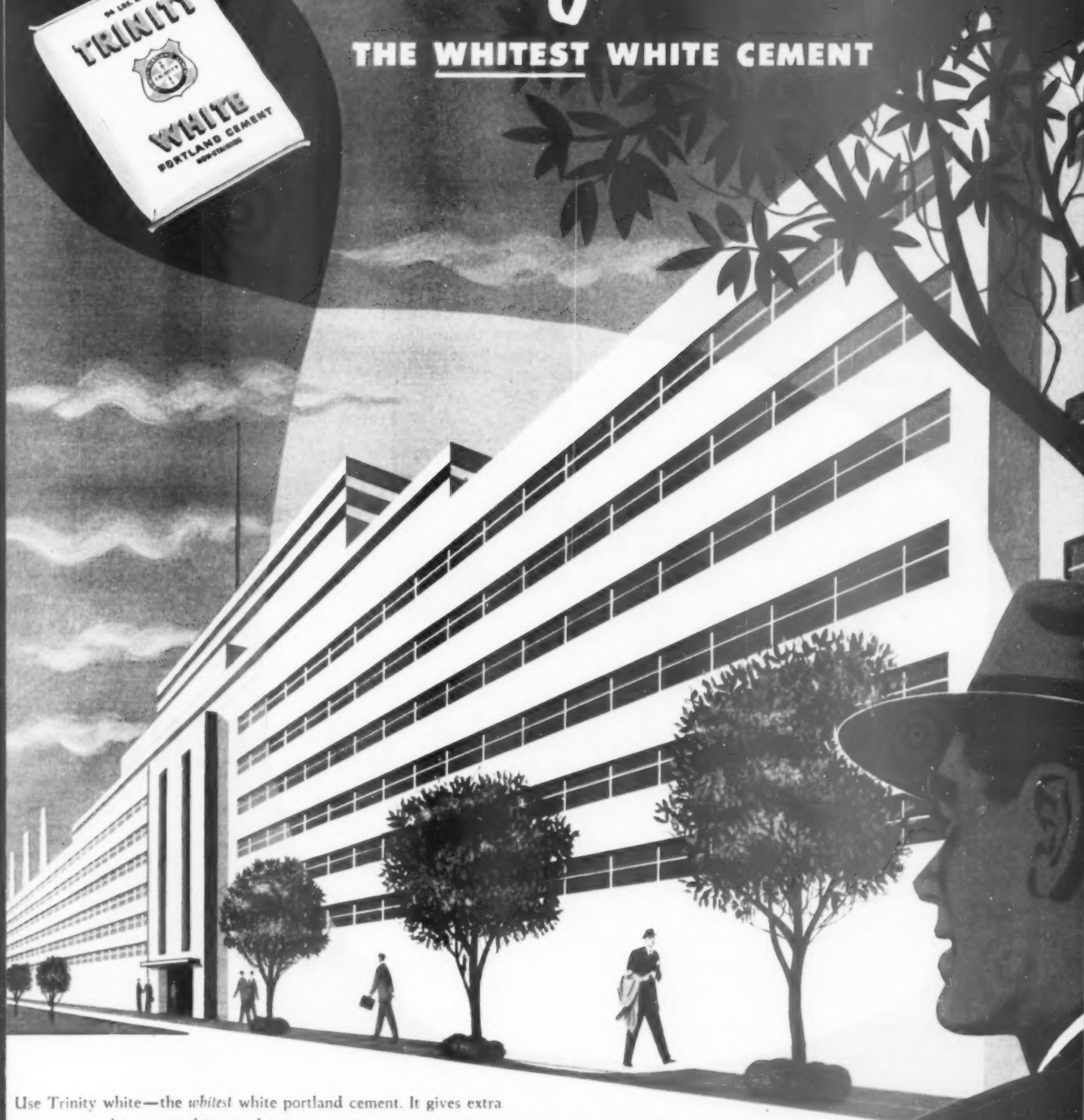
Multiplex Machinery Company has been making concrete production machinery for over 40 years. Our engineers will help you plan your plant expansion. We can show you how Multiplex automatic block machines, mixers, skip hoists, and compartment aggregate bins can make your operations more profitable.

MULTIPLEX MACHINERY COMPANY

DIVISION OF MULTIPACK, INC. • ELMORE, OHIO

Trinity White

THE WHITEST WHITE CEMENT



Use Trinity white—the whitest white portland cement. It gives extra eye-appeal to . . . architectural concrete units . . . stucco . . . terrazzo . . . cement paint.

Trinity has many special uses because of its beauty and light-reflective properties. Trinity white is a true portland cement that meets all Federal and ASTM specifications.

General Portland Cement Co., 111 W. Monroe St., Chicago; Republic Bank Bldg., Dallas,
816 W. 5th St., Los Angeles; 305 Morgan St., Tampa; Volunteer Bldg., Chattanooga.

true portland cement

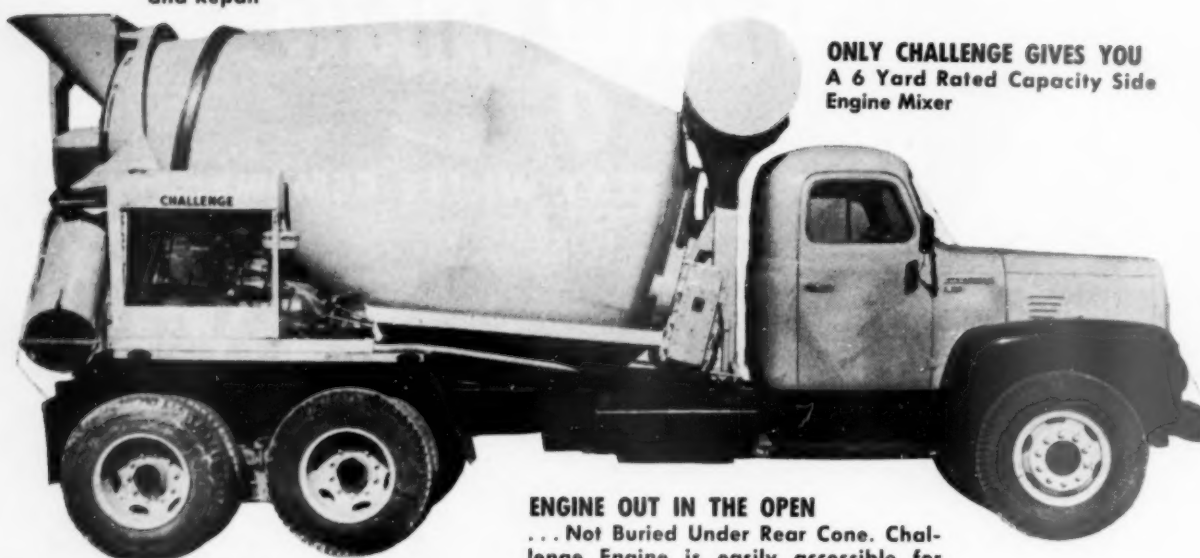
As white



as snow

... plain or waterproofed

SIMPLICITY OF DESIGN
Means Less "Down
Time" for Maintenance
and Repair



ONLY CHALLENGE GIVES YOU
A 6 Yard Rated Capacity Side
Engine Mixer

STRAIGHT LINE DRIVE
... engine, transmission, drive-
line, and gear reducer all in
straight line and out in the open.

ENGINE OUT IN THE OPEN
... Not Buried Under Rear Cone. Chal-
lenge Engine is easily accessible for
service, and may be removed in less
than 20 minutes.

SIDE ENGINE MIXER



Operating Controls also are out
in the open at rear of mixer.

...first introduced by CHALLENGE

By placing the mixer engine to the rear at the side of the drum, the center of gravity is moved forward, moving thousands of pounds of additional weight ... all extra net payload ... on a heavy duty front axle. For example, in many states the Challenge 5 Yard Mixer is legal with full-rated load of concrete on a

176" wheelbase, 3-axle truck. The same 176" wheelbase truck equipped with a heavy duty front axle will carry the Challenge 6 Yard Side Engine Mixer loaded to rated capacity ... an increase payload of 1 full cubic yard of concrete! **Only Challenge can offer this advantage!**

See your nearest Challenge Dealer for complete details. Challenge Side Engine Mixers are currently in production on 5, 6 & 6 1/2 yard sizes ... N.R.M.C.A. rated capacity.

Cook Bros. Equipment Co.

Please send name and address of my nearest Challenge dealer where I can get complete information on the Challenge Side Engine Mixer.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____

STATE _____



COOK BROS.
EQUIPMENT COMPANY

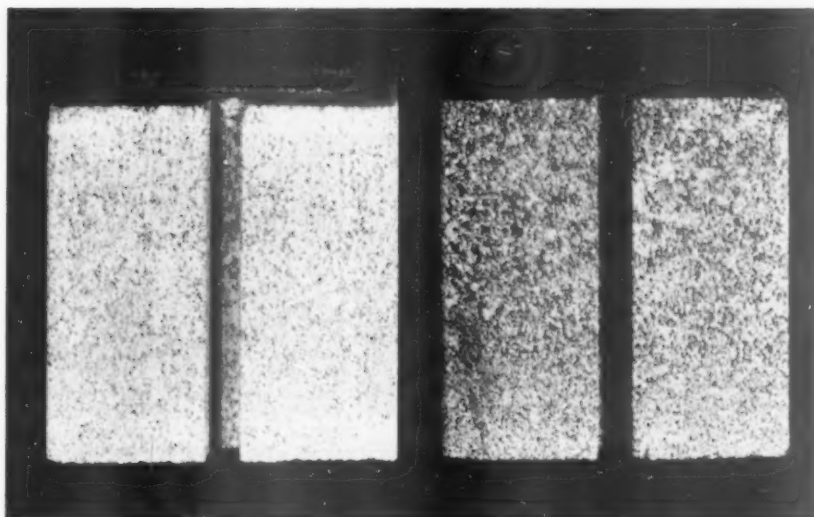
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Los Angeles 31 California

Exclusive National Distributors for
CHALLENGE, The Modern, Streamlined Truck Mixer

Better Concrete Blocks at lower operating costs by adding economical D-40

Let us show you how we have helped other concrete products manufacturers make superior blocks and at the same time reduce operating costs.

You will experience these advantages by adding a small amount of Detergent D-40 to the dry cement or wet mix.



Block A (left) made with D-40; Block B (right) made the old way.
Note difference in texture, color, appearance. Sharp edges and corners.

Better appearance—smoother, whiter, finer surfaces

Greater strength—less water produces stronger concrete

Closer bonding—saves on painting and waterproofing

Reduces abrasive wear on mixing and molding equipment

Saves time—mixes pour into molds faster—"break" cleaner

Easy to use—just add to dry cement or "mix"

Economical—D-40 costs you a fraction of a cent per block



D-40 is a granular detergent widely used in manufacturing many different molded concrete products. It is supplied in 85# bags by Oronite, the world's largest producer of synthetic detergent raw materials. Because of its qualities only one to two oz. of D-40 per bag of cement is needed to obtain outstanding results. With D-40 you are assured of a stable, economic source of supply.

Ready-mixed concrete producers have found D-40 improves their product.

For complete information, samples and technical help write or call the nearest Oronite office.

ORONITE CHEMICAL COMPANY

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MERCANTILE SECURITIES BUILDING, DALLAS 1, TEXAS



THE HOSPITAL THAT SERVES A MILLION PEOPLE



'Incor' Speeds Concrete-Frame Erection

New Beekman-Downtown Hospital, first general hospital built in Manhattan in 20 years—ultra-modern, 8-story, reinforced-concrete frame, cost complete, including land, \$5.5-million.

When the project ran into cold weather, the Contractor switched to 'INCOR' 24-HOUR CEMENT—maintaining well-planned frame-erection schedules, with important heat-protection savings. Smooth-working 'Incor' mix facilitated finishing.



● Upwards of a million people work or live in Lower Manhattan. To provide adequate hospital facilities, this ultra-modern, 170-bed Beekman-Downtown Hospital replaces the former 96-bed institution.

The Hospital's Directors wanted the best of everything—with utmost emphasis on dollar values. So fullest use was made of reinforced concrete frame construction, with its inherent fire-safety and economy.

Here's Why They Ask for 'Incor'

With relatively long spans of about 21 ft., the well-planned concreting schedule was maintained during Summer, using Lone Star Cement and stripping when concrete attained 2,000 lbs. per sq. in.

Cold weather slowed the job and made costly heat protection necessary, so the Contractor switched to 'INCOR'* 24-HOUR CEMENT. The job was quickly back on schedule . . . concrete was stripped in 2-3 days, with minimum heat protection.

Right around the calendar, 'Incor'* promotes smooth-running, time-saving efficiency on which today's profits depend. One reason why so many Ready Mix Operators make 'Incor' concrete available as part of their good service.

*Reg. U. S. Pat. Off.

BEEKMAN-DOWNTOWN HOSPITAL
Architects: **LORIMER & ROSE**
Structural Engineers:
ROBERTS & SCHAEFER CO.
Contractor: **CAULDWELL-WINGATE CO.**
Concrete Contractor:
RIZZI CONSTRUCTION CO., INC.
Ready-Mix Lone Star and
'Incor' Concretes:
COLONIAL SAND & STONE CO., INC.
—All of New York City—



LONE STAR CEMENT CORPORATION



LONE STAR CEMENTS COVER
THE ENTIRE CONSTRUCTION FIELD

Offices: ABILENE, TEX. • ALBANY, N. Y. • BETHLEHEM, PA. • BIRMINGHAM
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LONE STAR CEMENT, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS: 17 MODERN MILLS, 126,000,000 SACKS ANNUAL CAPACITY

Wisconsin Producers to Advertise

Annual meeting of Wisconsin Concrete Products Association discusses building code revisions, concrete admixtures, and votes for assessments for joint advertising program

THE 33RD ANNUAL MEETING of the Wisconsin Concrete Products Association was held in Milwaukee on January 14-15. The association's value is attested to by the fact that five new companies have joined since the last meeting, as well as by the large turnout of members at the sessions. One of the principal topics discussed was the proposed revisions in the state building code affecting concrete masonry. Another subject that elicited much discussion was the proposal to run a series of cooperative advertisements in which participating companies would be listed by region.

Election of Officers

Ray Minette, Berthelet Fuel and Supply Co., Milwaukee, was elected president, succeeding Paul Jensen of Jensen Block Co., Racine. Moving into the vice-president's post was Fred Radandt, Fred Radandt & Sons Co., Manitowoc. The remaining officers are Frederick Yahr, West Bend Concrete Products Co., West Bend, 2nd vice-president; Edwin Bartlett, Jr., Best Block Co., Milwaukee, treasurer (re-elected), and A. W. Devos, Devos Block Co., Milwaukee, secretary (also re-elected). Members of the board of directors are as follows: Ray Melville, Wisconsin Valley Concrete Products Co., Wisconsin Rapids; Harry Sorenson, Waylite Concrete Masonry Co., Racine; Roy Jensen, Janesville Sand & Gravel Co., Janesville; A. L. Brown, Baraboo Concrete Products Co., Baraboo; and L. A. Clark, Wausau Concrete Products Co., Wausau.

Products and Methods Forum

The four panel members participating in the forum brought out much

of value to the industry. Of most concern to Wisconsin producers were the proposed revisions in the state building code, reported by O. Neil Olson, Marquette University, Milwaukee. The association board of directors, working with Mr. Olson, had sub-



Paul Jensen, retiring president, and Mrs. Gertrude Bauer, registration committee

mitted a formal request to the Wisconsin State Industrial Commission requesting a number of modifications to be made in the building code. Before describing each proposed modification in detail, Mr. Olson warned the members that it is not at all certain how the Industrial Commission will act. The procedure, however, if the Industrial Commission passes upon the recommendations favorably, is to submit the revisions to an advisory committee; if accepted by this group, the revisions will be taken up at public hearings, after which they

will be advertised in the state newspaper for a period of 30 days. If no objections have been raised up to that time, the revisions will become part of the state building code.

The proposed revisions are described here in detail.

Minimum compressive strengths of concrete block—loadbearing. The Wisconsin state building code specifies that the average compressive strength of five units shall not be less than 1000 p.s.i. Since most state code specifications for concrete block generally followed A.S.T.M. standards, the board of directors requested that the strength requirements of A.S.T.M. C90 be followed. This states that the strength of an individual unit shall not fall below 800 p.s.i., though the average strength of the test units has to remain at 1000 p.s.i. This change would bring the Wisconsin code into agreement with A.S.T.M. for class A (loadbearing) units. Mr. Olson said that test data have indicated that a significant number of units in the lightweight group fail to pass because one unit may fall below the 900 p.s.i. minimum; even though the average strength is frequently well above 1000 p.s.i., the whole set will be rejected.

Maximum allowable stress in mortar used in concrete masonry is 100 p.s.i. Thus, Mr. Olson pointed out, acceptance of an 800 p.s.i. minimum would give a block to mortar strength-stress ratio of 8:1, which he considered somewhat higher than is usually considered necessary. However, Mr. Olson said that the Industrial Commission was not optimistic about this change.

Header every seventh course of brick facing. The state building code now specifies that bonding of each tier of units shall be secured by means of a full header course of brick every sixth course, or equivalent, also that the bond courses shall be placed at intervals not exceeding 16 in. The present requirement, Mr. Olson pointed out, is such that every other course of the masonry back-up will be of brick header units, a unit not generally subject to compression or absorption tests. Therefore, the Wisconsin Concrete Products Association has requested that the wording of the present building code order be changed from every sixth to every seventh course, and that the maximum spacing of bond courses be changed from 16 to 18 in.

According to Mr. Olson, "A change from sixth course to seventh course headers will eliminate the need for header units, if desired. From the in-



Officers and Directors of the Wisconsin Concrete Products Association. Left to right, sitting; Edwin Bartlett, Jr.; Ray Minette, A. L. Brown; standing, Fred Radandt, L. A. Clark, Frederick H. Yahr, Harry Sorenson and A. W. Devos



Caught preparing for the panel session are A. W. Devos, secretary of the Wisconsin association; Herbert Loucks, Madison, and O. Neil Olson, Marquette University

side the wall will show two courses of concrete masonry and one course of brick stretchers. Elimination of the use of header block will result in economies of construction through one less type of block to manufacture, handle, deliver and get in place. Although no test data are at hand on this point, it is believed that this type of wall is structurally superior because of the more complete bedding of the header brick on both the upper and lower faces."

A further advantage that the speaker said would accrue from such a change is that all concrete units in the wall, both brick and block, would represent "approved units." Header block have been assumed to be essentially the same as standard units. Though this was said to be true in most cases, the elimination of header block "will not work to the disadvantage of either the producer or the user of concrete masonry, or to the detriment of the construction industry." Mr. Olson quoted the Industrial Commission as saying the proposed change has merit and will be studied.

Classification of concrete brick. A question had been raised, Mr. Olson said, concerning the proper interpretation

of the building code's requirements for concrete and clay brick. One section of the code (Order 5305-5-(a)) specifies the compressive strength, 24-hr. absorption, C/B ratio and grade of brick manufactured from burned clay or shale; another code section (Order 5305-5-(b)) specifies the compressive and cross-bending strengths of concrete and sand-lime brick. As Mr. Olson explained it:

"Although there is nothing in our state building code which states that concrete brick cannot be used for exposed work, there is also nothing which states that they can be used. By implication, it has been observed that architects and builders have sometimes been hesitant to use brick in exposed work largely because of the omission of specific permission in the state building code. Some of the questions that come up are:

1. If concrete brick can be used for exposed work, why is there no test for absorption as in the case of concrete block, or for absorption and C/B ratio as in the case of clay or shale brick?

2. Why are concrete brick tested in cross-bending for modulus of rupture while clay brick are not?

It is an established fact that some clay brick are quite weak in cross-bending, as indicated by the tests of brick that were shipped into this area for use on a large housing project as well as general shipments for public sale.

3. Are we to assume that, by virtue of comparative average compressive strengths, the concrete brick are the equivalent of clay or shale brick of Grades M. W. (moderate exposure) and N. W. (no exposure)?

"As a result of these and other questions, it has been recommended that the entire matter of the specifications for all brick be studied with the view of combining the present specifications in such a way that

either type must pass the same tests in order to receive the same grade classification. If the absorption and boiling test is of importance in clay brick tests it certainly should be equally important in concrete brick. Similarly, if the cross-bending test is essential in the case of concrete brick it could be reasoned that it is equally essential for clay or shale brick.

"There has been some hesitancy expressed over including sand-lime brick in a specification with clay or shale and concrete brick. I do not believe that this point should be any cause for concern since it appears quite probable that sand-lime brick will not pass a test for classification as a building brick. However, if sand-lime brick can pass the test there seems to be no reason why it should not receive a classification.

"In order to clarify Order 5305 for the users and the producers of clay, shale, concrete, or sand-lime brick it was suggested that notification be given to all to the effect that, if desired, brick tested in accordance with Order 5305-5-(a) will be classified for the several exposure conditions. The major change involved would be that the test for modulus of rupture and compressive strength, now required, would be supplemented by the test for water absorption by 24-hr. immersion and by 5-hr. boiling, and for C/B ratio if classification is desired by either the manufacturer or the consumer. This procedure is being followed for several Wisconsin concrete brick producers at this time. The test reports have been accepted by the Wisconsin Industrial Commission although no particular comment on them has been made to me.

"It was further suggested that the matter of tests of all colored concrete brick be officially clarified. In the event that a manufacturer produces brick of several colors, must all test brick be natural gray, or will tests be required of each color or of a mixture of colors? It appears that only the natural gray brick have been acceptable for test purposes in some cases. The wisdom of this practice seems questionable to me, since the assumption that colored brick will test higher than the natural gray brick seems unfounded."

Another suggested revision, this one for block compression testing methods proposed by A.S.T.M. Committee C-15 on Manufactured Masonry Units was described in considerable detail by Robert A. Burmeister, City of Milwaukee Testing Laboratory. The revision concerns the method of capping a block. Until 1950 there was no requirement for accuracy of bedding; for use in compression testing machines; now a bed must be within .003 in. of a constant height over a length of 16 in. If the surfaces compressing the block are not plane, then the upper platen bears on any protuberance and a corner, giving a low test as the corners receive a concentration of stress and break first.



Retiring president Paul Jensen, right, hands over gavel to the incoming president, Ray Minette

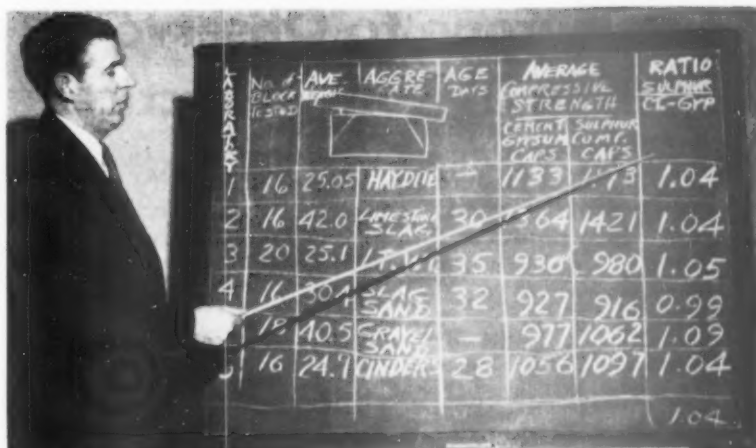
In the quest for improved testing means, Grant Durant, Froehling and Robertson, Richmond, Va., developed a bedding material consisting of sulfur and sand, also called Leadite or Tegul. This material was tested in a number of laboratories, including the Milwaukee City Laboratory. Results were inconclusive because of insufficient number of tests. Mr. Burmeister had suggested, and is now engaged in, making tests on locally-produced block using the new bedding material. The initial tests are shown in the illustration. The "figure of merit" (ratio of sulfur/cement-gypsum bedding materials) shows a definite advantage in use of the new bedding material. However, it does have disadvantages, the speaker pointed out. It has to be heated to 280 deg. F. during preparation, it is time-consuming to prepare, and it is expensive.

The advantages of modular concrete masonry units were discussed by Charles W. Yoder, Portland Cement Association, Milwaukee. The speaker said he objected very strongly to non-modular construction, for he has a section in his basement that is painfully evident. The unsightly appearance resulting is a disgrace to the industry, Mr. Yoder emphasized. In addition to the aspect of appearance, other advantages result from modular construction. A producer loses production time if he must switch molds to make three different block of the same nominal size instead of only a modular unit. Storage space is also saved with modular units. Producers should appreciate the 5 percent saving in materials realized by making a modular block, the speaker mentioned. But one of the biggest reasons for making modular units is from the design standpoint—the fact that there is only one height to consider saves time for the architect.

James J. Collins, Spray-O-Bond Co., Milwaukee, briefly described concrete admixtures. Though there is no perfect substitute for cement, the speaker said, air-entraining agents have become one of the biggest boons to concrete manufacture. He also described the use of plasticizers, which he cautioned are not to be considered cement substitutes.

In the question and answer period that followed the panel's discussion, one member asked why 1000 p.s.i. compressive strength was required for concrete units instead of 750 p.s.i. This, it was said, dates back to a series of tests in 1938 designed to determine strength values for tamped and vibrated units. These units were tested for freezing and thawing resistance, absorption and shrinkage and it was found that a 1000 p.s.i. unit withstood more cycles of freezing and thawing. This decision was made, however, with knowledge of the advantages of a 750 p.s.i. unit—more economical to manufacture, better sound absorption, less thermal conductivity, and good nailability.

(Continued on page 190)



No. of Blocks Tested	AVE. BLOCK WEIGHT (lb.)	AGGREGATE (pcf)	AGE (days)	AVERAGE COMPRESSIVE STRENGTH		RATIO SULFUR/CEMENT-GYPSUM
				CEMENT	SULFUR/CEMENT-GYPSUM	
1	16	25.05	HAZARD	1133	1113	1.04
2	16	42.0	HAZARD	1364	1421	1.04
3	20	25.1	17.5	930	980	1.05
4	16	30.1	SLAG SAND	927	916	0.99
5	16	40.5	SLAG SAND	977	1062	1.09
6	16	24.7	CINDER	1056	1097	1.04

Robert A. Burmeister, City of Milwaukee Testing Laboratory, used blackboard to explain tests made on block using new method of capping



Left to right: Eugene Kleist, Eau Claire; Fritz Forrer, Milwaukee, and Ludwig Neth, Vancouver, Wash.



Panel members prepare for the "products and methods forum"



A group at one of the banquet tables. Left to right: W. E. Gifford, Madison; Charles Gatzke, Des Plaines, Ill.; Roy Krienke, Merrill; Robert S. Reed, Three Rivers, and Mrs. Krienke

Tours Europe to Observe Concrete Masonry Practices

John L. Strandberg, Sr., of Kansas City inspects many concrete block and pipe plants during recent vacation trip

By TIP BROWN

HIS THIRD TRIP to European countries in recent years to gain wider knowledge of concrete masonry practices and uses was made by John L. Strandberg, Sr., Kansas City, Mo., who with Mrs. Strandberg and the family car, returned to the United States the middle of last October. During their trip of six months, they had driven 15,000 miles and had leisurely visited countries that held special interest for Mr. Strandberg with regard to various types and uses of basic building materials. European manufacture and practices in concrete masonry construction were the main objectives. Having been active in the National Concrete Masonry Association (he was the first president following the reorganization in 1941) and having seen the membership show a 300 percent gain in the intervening years, he had acquired a national viewpoint of the industry and a growing belief in the opportunities for expansion into new fields of usefulness.

The ship landing was at Göteborg, a Swedish city of nearly half million people where concrete units were being consumed in tremendous quantities for ultra-modern apartment and commercial structures. This port is the receiving center for a large part of the production of the great lightweight aggregate plant at Yxhult, Sweden, midway between Stockholm and Orebro.

High Production in Sweden

This aggregate is produced from a 50-50 combination of limestone and shale which is burned to a clinker and then ground to 100 mesh fineness. The manufacturing equipment is similar to that of American portland cement mills and the cost of the plant was around \$1,500,000. The powder is converted at the site to solid concrete building units, 10 x 10 x 20 in., weighing 24 lb. Some 25,000,000 units are produced annually and shipped to terminal points for local use or for export to the neighboring countries of Norway, Denmark, Germany, and a few others within favorable shipping range. These lightweight block are used exclusively above ground and were seen on structures as high as ten stories, where they also serve as bearing walls for concrete floors.

Smaller block plants are scattered

about the country where natural aggregates are used for producing foundation block. These block are usually 12 x 12 x 12 in. with 15 small round apertures and weigh approximately 80 lb. Some 8 x 8 x 12 in. partition block are made. All of these units closely approach compressive strengths of standard American units, and the difference in size is largely accounted for by the decimal system in common use with building designers. The same general standards of manufacture and materials exist throughout Europe except that clay products predominate in France and Italy.

Stucco is used extensively on concrete masonry exteriors. No furring is used with the lightweight block, gypsum plasters are mainly in use which are applied directly to the inner walls. Plywood, asbestos shingles for both new and replaced roofs, and Transite are in general use. New house construction is invariably masonry in large cities where fireproof construction is mandatory (by ordinance). Rural areas use considerable wood construction, but there is a distinct trend to masonry.

From Sweden to Italy

Sweden leads in the production of masonry materials and Denmark is second. Sweden is also a heavy producer of lumber. Production is widely influenced by the ease of water transportation which results in a much larger interchange of commodities between countries. England is practically self-sustaining in the production of masonry materials; Belgium leads in the production of portland cement with a large export business. It is well advanced, too, in the use of masonry construction. France uses much native stone which is produced in quarries widely scattered over the country. Reconstruction from war damage is less advanced than in Germany, Holland and Italy. Conflicting political interests are credited with the lack of progress.

A first visit to Italy came as a result of a long cherished desire to see some of her world-famous cities. The absence of middle class people drew attention to the cultural accumulations of the wealthier segments of the population and, by the same token, to the apparent poverty of the less



John L. Strandberg, Sr., left, talking with Oscar Nylander, general manager of Lulea Coal & Material Corp., Lulea, Sweden

fortunate. A great program of reconstruction was under way with perhaps the most outstanding development in the \$50,000,000 railroad station in Rome. While not entirely finished, the design and facilities measure up with the best to be found anywhere. An unforgettable sight was the bombed out villages and small cities in the DeFuga pass and Po River valley areas; replacements were invariably located at some little distance away.

An eventful experience on the trip was a visit to the Olympic games in Helsinki, Finland. The city, itself, presented an astonishing sight in its ultra-modern appearance with wide streets, eight to ten story office and apartment buildings, and large department stores and hotels, none of which suffered by comparison with our own facilities in this country.

Competing for interest in the itinerary was the opportunity to visit the scenes of his childhood at his birthplace, Lulea, in northern Sweden, and to enjoy family fellowship with two brothers and three sisters who live in that vicinity. Mr. Strandberg left home at 18 after a high school education, headed for this country, and found a construction job with a distant relative at Manistique, Mich. After a year, he went to Chicago and studied engineering at Chicago Technical College. His later activities were with grain elevator builders. He met his long time business associate, C. E. Swanson, while he was on a flour mill job in Kansas City.

Their venture in the concrete block field in Kansas City started in 1923 with two small semi-automatic machines, each producing 600 block daily, size 8 x 8 x 12 in. Four years later, a new plant was built on the present site and production increased to 1000 block daily from each of the two machines. In 1930, a switch was made to higher capacity, tamper-type machines which raised production to 3000 block per day. Again in 1945 with new equipment, additional curing rooms and new office space, the capacity was boosted to a daily maximum of 30,000 block, 8 x 8 x 16 in.



Views at the plant of K/B Betong Sander & Co., Henoret, Sweden. (1) Pipe machine in which the core is moved down by hydraulic power. Pipe are vibrated and compressed under 3 to 4 tons pressure. (2) Turntable under concrete mixer. (3) Pipe form on vibration table which has a frequency of 4200 cycles per minute with an amplitude of 2 mm. (4) Heating concrete pipe electrically. About 200 kw.-hr. per cu. yd. is used. Pipe are heated to 60 deg. C. for 8 hr. (5) Hoppers for concrete to supply the block machines are filled by buckets transported by electric lift truck. (6) Truck-trailer combination to haul concrete pipe from storage yard. (7) Starting to load large concrete pipe on special 6-wheel drive haulage truck. (8) Pipe are drawn up on the pivoted platform by means of steel cable and pulley. (9) Traveling electric hoist used for stockpiling and loading in the yard

NEW MACHINERY

Fork Lift Trucks

TOWMOTOR CORP., 1226 E. 152nd St., Cleveland 10, Ohio, has announced that four of its fork lift truck models



Diesel-powered fork lift truck

are now available with either gasoline or diesel engine. These are the LT-62, LT-60, No. 460, and 480-P. The manufacturer claims that tests of the diesel engine selected for these applications proved it capable of developing unusual power for its size and weight.

Line Stretcher

UNITED BUILDERS, 1822 Lindberg Drive, Muskegon, Mich., is manufacturing a linestretcher which is designed to do a better job of blocklaying by maintaining the tightest line possible with minimum sag and leaving no holes in the completed mortar joints. They are made of cast aluminum alloy and are designed to anchor the ends of the line; serve as jointing tools; and be used as a line reel. The

line stretchers are made in five different models; No. 8 for 8 in. modular block construction; No. 12 for 12 in. modular block construction; No. 86 an 8 in. and 6 in. combination unit (may be used on walls 4 to 8 in. wide); No. 810 an 8 and 10 in. combination unit; and No. 812 an 8 and 12 in. combination unit (may be used on walls 6 in. to 12 in. wide).

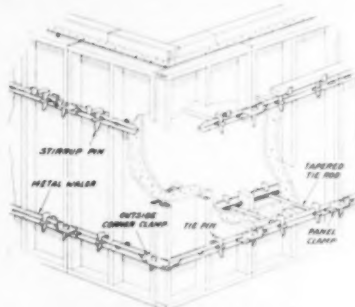
Quick Drying Enamel

REX INDUSTRIAL PAINT WORKS, Ossining, New York, has announced a quick drying heavy-duty enamel called "Liquid Glaze." The company claims the following advantages for the product: easy brushing; excellent coverage and greater durability. The enamel has been tested on the following surfaces where it is claimed to have excellent adhesion: metal, wood, glass, ceramics and masonry including concrete, brick, stone, stucco, tile and asphalt shingle.

Wall Forms

ROCFORM CORP., 15160 W. Eight Mile Rd., Detroit 35, Mich., announces a method of forming concrete walls for basements, one-story homes and light commercial construction. Inside filler corner forms eliminate the necessity of fillers, it is claimed. Outside corner clamp makes it possible to lap corner panels to arrive at necessary fractional wall dimensions without fillers. Forged tapered tie rods carry working loads of 7200 lb. and give desired wall thickness and can be re-

claimed from every job. Walers eliminate waler handling and replacement, forming walls are spread and tied together in one operation when tie

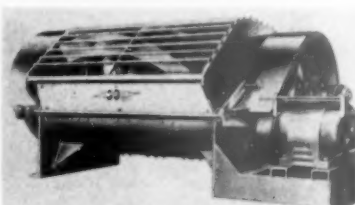


Line drawing showing details of concrete forming

rod pins are inserted into tie rod and waler. These basement forms can be set up in 2 to 3 hr.

Batch Mixer

GOCORP, Adrian, Mich., announces the production of a 75-cu. ft. batch mixer. The machine, it is claimed, will make it possible for operators



Batch mixer with 75 cu. ft. capacity

using modern production block machines to give lightweight aggregates the necessary extra mixing time and still keep their production at full capacity. The mixer is no higher than usual capacity machines and is powered by a 50-hp. electric motor. It has an air-operated discharge door and mix-timer as standard equipment.

Pallet Truck Line

CLARK EQUIPMENT Co., Industrial Truck Division, Battle Creek, Mich., has announced the production of the 1953 models in the Powrworker lift-truck line. The new models are pallet trucks, electric battery-powered, with a capacity rating up to 6000 lb. The trucks can be supplied with pallet forks to handle any size pallet, whether single or double faced. One model is arranged for single tray (1 x 6) layout of battery while the other accommodates a double tray (2 x 3) layout of battery. The trucks feature double hoisting cylinders for lifting the loaded pallet, motor-in-wheel drive, full time delay control with all contactors interlocked, safety-spring return handle which applies brake and cuts off power, and a bumper guard located higher. The frame, forks and elevating carriage are of cast steel.



Linestretcher made of cast aluminum alloy

5. A producer views the ready-mixed concrete business

EQUIPMENT REQUIREMENTS

A BATCHING PLANT consists principally of ground storage, elevating equipment, overhead storage bins and a combination weigh hopper-scale. When operations call for either pre-shrinking or mixing at the plant, a central mixer is added which is placed at a point under the weigh hopper and a spout or hopper which discharges into the truck mixer or other concrete carrier.

At a batching plant, weighing equipment is the nerve center of the operation; the weigh man is the key person. At a central mixing plant, the mixer is the heart of the operation with the mixer operator being an all important individual.

At practically all ready-mixed concrete operations, aggregates stored in overhead bin compartments flow by gravity into a weigh hopper, located directly under the compartment discharge gates.

You have an efficient overhead storage arrangement if:

1. Only well-graded, moisture-controlled aggregates are placed in bin compartments.
2. You have sufficient compartments to handle required sizes of aggregates.
3. Storage is adequate to keep weigh hopper full for each weighing operation of the day.
4. Each bin compartment has two fast operating, properly placed discharge gates.
5. Aggregates with a minimum of segregation, swiftly gravity feed the weigh hopper.
6. A bin indicator, or other control method, is used to keep a close check of material in each bin compartment.
7. In a crane fed operation, compartment sides are far enough apart so that the material bucket can function properly (bin compartments should have a minimum width of 7 ft.).

Even with efficient bin arrangements, several operating problems must be faced:

- (a) Job requirements demand that an additional size of aggregate or another kind of aggregate be used; solution, divide the least used and most convenient compartment into two sections. This easily made adjustment is only possible when original compartments are properly equipped with two discharge gates.
- (b) When compartment is filled the night before with sand containing 5 percent to 7 percent moisture, by the next morning

By JAMES A. NICHOLSON

sand in the lower part of the compartment will contain excessive moisture (10 percent to 15 percent); solution—to attain desired slumps on the first few loads, sand weights should be increased and added water reduced in amounts necessary to compensate.

- (c) Where bin compartments are charging weigh hoppers equipped with automatic scale features, the same aggregate, in a similar condition, should always be placed in a bin compartment. Dry sand flows at a different speed than damp sand; 1½-in. stone flows differently than sand. The accuracy of automatic scaling devices is largely dependent upon the constant flow of material. Place the same size aggregates, well-graded and moisture-controlled, in the same compartment. If a change of aggregates is necessary, adjustment must be made in the timing mechanism of the automatic controls.

Batches that go into a transit mixer or the plant mixer are prepared in a weigh hopper through a process that is primarily a weighing operation. Here is one operation where painstaking exactness must be the

rule. Such efficiency is absolutely necessary if consistent quality concrete is to be processed. The use of inadequate weigh hopper scaling equipment or incompetent personnel is inexcusable.

Today, when we speak of a weighing operation at a ready-mixed concrete plant, we must consider everything—moisture compensation, the weighing of cement and aggregate, the measurement of mixing water and the dispensing of air-entraining agents, calcium chloride or other admixtures. At the 1952 Ohio Concrete School, Julius Warner, Richter Concrete Corp., Cincinnati, Ohio, stressed the importance of accurate weighing when he said, "No amount of technical skill in gradation of aggregates and designing of concrete mixes can compensate for sloppy and careless weighing."

Check Sand Moisture Content Regularly

Determination of and adjustment for moisture content of aggregates (especially sand) are required if an operator is regularly to process concrete of specified yield, slump and workability. Unless compensation is made for surface moisture variations, the addition of a given amount of water may produce concrete in which slumps vary as much as 3 in. Dry sand contains very little water. A cubic foot of wet sand may well contain over a gallon of water. Yet many producers have no idea of the moisture condition of the sand which they



Adequate bin capacity for aggregates and cement is essential for efficient operation

are using in concrete. At such operations, regardless of the moisture conditions, constant sand weights are used.

In batches containing dry sand, the concrete probably will be oversanded and there will likely be an over-yield together with higher air contents and lower strength. In wet sand batches, concrete will not be as workable as desired, there will be low air contents, and yield requirements will not be met. Unless the amount of water present in sand is taken into consideration and proper compensation made, the processing of quality concrete with any degree of uniform consistency is practically an impossibility.

Some operators make efficient use of sand drying equipment in determining moisture contents. This laboratory method is generally too slow. Moisture determining devices, based on principles of water displacement, are sufficiently accurate and give quick answers. Such instruments can be purchased or leased. A number of operators have enjoyed satisfactory controls through the leasing of [SC]² equipment which includes a moisture determinant, an accurate, fast-reading compensating scale, and an inspectograph which automatically records the weight of each ingredient in every batch of concrete.

Your plant should have a moisture determining facility which should be regularly used. Even if a moisture determinant is not available, seek close control over moisture fluctuations by draining damp aggregates in storage a given number of days. Only aggregates of uniform moisture content should be elevated to overhead storage. Weighing operations should be performed on a compensating batching scale. Batch weight forms or charts (e.g., Jaeger Accurabatcher) should be used to give fast accurate changes to compensate for variations in moisture content.

The weigh hopper should be so shaped as to clean out completely, and be of sufficient size to weigh out a full load for the biggest transit mixer used at the operation. The weigh hopper should be equipped, at a minimum, with a beam scale (combined with over and under) and preferably with a scale having, (1) a springless full reading dial, (2) poises to compensate for moisture, and (3) weighing mechanisms reversed so that, at full weight, the dial pointer returns to zero. When possible, materials (especially cement) should be weighed separately rather than cumulatively. The weigh hopper scale combination may be manually operated or can be completely automatic. With the turning of a knob and the pushing of a button on the face of a control panel, many combinations of mixes and sizes of batches can be automatically weighed out. Fully automatic plants have been used successfully on large government projects, as well as in some of the bigger operations.

How Many Automatic Features?

Many producers feel they would sooner read about such operations than install completely automatic weighing features at their own plants. They say that push-button plants with all their electronic, air and hydraulic mechanisms require the use of higher skilled operators and better trained maintenance men. They say that the more gadgets you put into your plants, the more there is to go wrong; that more breakdowns occur, and that total down-time shows a sharp increase. Within limitations, we subscribe to this line of thinking.

If weigh man is situated on the same floor as the weigh hopper, manually operate the discharge gates of the aggregate compartments. To get accurate weighing, always use a two-speed, push-button conveying system in charging the cement weigh hopper. If weigh man is situated on a lower floor level, control the aggregate gates with efficient air or hydraulic valves, manually operated. If you are now operating a fully automatic plant, treat it "tenderly." Always keep materials in the same bin compartment. Weigh each material in a separate hopper, on a separate scale. The special equipment should be regularly cleaned and thoroughly maintained. In the use of automatic equipment anywhere in your plant, always remember that it is not fool-proof and that it does need extra attention.

There are some producers who professedly operate push-button plants, yet do nothing about compensating for moisture differences in their aggregate; nor do they make an honest continuing effort to otherwise control the consistency of their concrete. It might be wiser to consider the installation of several smaller, more economical area plants than to put most of what you've got into one big monumental, completely-equipped operation.

Your weighing operation is efficient if:

1. Scale facilities are fast and accurate.
2. Compensation is made for moisture content of aggregates.
3. Hoppers and scales are of sufficient size to completely charge the mixer or other carrying unit.
4. Batches are readily available for prompt loadings of transit mixers, or at a central mixing plant, weighing is completed within the time limits of the mixing or preshrinking cycles.
5. Weigh hopper through its discharge gates swiftly "ribbon feed" materials into a transit mixer or plant mixer without the development of cement balls.
6. Weigh hopper cleans out completely without the use of vibrators and the complete discharge is shown on a full reading dial.

A major operating problem concerns the use of air-entraining agents, calcium chloride, dispensing materials

and other admixtures. All these items should only be handled through automatic fool-proof dispensers. Their use should be placed under close control. Dispensers of such material should be regularly cleaned and carefully maintained so that automatic features give accurate performance whenever the inclusion of these admixtures becomes a part of the weighing operation.

Of prime importance in every mixer load of concrete is close control over the mixing water. No decent producer would ever think of cheating on cement contents. Actually, the addition of excessive water produces exactly the same effect.

At a central mixing operation, fast, accurate measurement of water is required. Similarly, in a matter of seconds, the correct amount of water necessary to produce a given consistency must be discharged into the mixer. If piped in under pressure, nothing less than a 2-in. pipe should be considered. If gravity is used, the pipe should not be less than 3 in. diameter. The measurement of water must be completed within the limits of the weighing cycle; the discharge of water into the mixer must coincide with the discharge time of aggregates and cement.

Water can be measured in a measuring tank, weighed out through a container on a scale, measured out by a meter, or gravity-fed through a pipe line under the control of a timing device.

In our plants, we use or have used all four methods. Our operating personnel prefer to take water from a surge tank (where the water level is maintained constant by means of a float operated hydrometer valve) and pass it by gravity in a 3-in. pipe through an instantaneous closing valve actuated by an electric timer. Our objection to the use of commercial meters is based on the problems of winter operations. When hot water is used, readings lose accuracy and added maintenance is required. In closing down at the end of the day, difficulties experienced in completely draining the meters have led to serious trouble. Actually, the final amounts of water used in our plant mixers are determined not by any of these methods, but by the slump determinant, upon which we are so dependent in controlling the consistency of our concrete.

In a transit mixer operation, responsibility for control of the mixing water can be placed with each of many drivers or with the weigh man (one man control). Water can be put into the truck mixer tank or directly into the drum. If the water tank on the truck mixer is used, the driver can be sent out without instructions or he can be told to put in only enough water to bring the concrete to a specified slump. Also, the weigh man can put into the mixer tank a given amount of water which, when used, should produce the desired

slump. In case added water is required, a limited quantity can be taken from the flush tank.

Transit mixer operators generally have found that they cannot control the consistency of their concrete in the field until, (1) either they take off the water tank or put into the tank only a given quantity of water, and (2) the weigh man regulates the amount of water. These steps cannot be considered until close control has been established over gradation and moisture content of the aggregates. At a batching plant, place control over mixing water in the hands of your weigh man.

To run a good central mixing operation, you've got to have an efficient plant mixer of proper size, employ competent personnel and practice sound mixing procedures. The size of the mixer should be geared to the capacity of the hauling units. If you are operating single axle trucks legally, the mixer should be able to handle up to $3\frac{1}{2}$ cu. yd.; if you are running tandem equipment, the plant mixer should be a 5-cu. yd. unit. If two discharges are required to fill the truck unit, provision should be made for a hopper to temporarily hold the first load. When mixing on the second load is completed, the hopper gates should be opened, permitting both loads to discharge together into the carrying unit.

Years ago I wrote this: "The basic requirements of an adequate central mixer are (1) fast, thorough mixing, (2) fast controllable discharge of concrete, free from segregation, and (3) long life and easy cleaning." The only new requirement that I would now add is that the mixer be equipped with a consistency meter which will control the concrete slump within a range of $\pm \frac{1}{2}$ in.

There are two basic types of plant mixers—tilting and non-tilting. A non-tilting mixer costs less, requires no extra air or hydraulic tilting equipment, and is a generally satisfactory unit either in preshrinking or in mixing plastic concrete. In our opinion, the tilting type mixer is a more efficient unit in that it more satisfactorily mixes low slump concrete and can discharge its load faster with less segregation.

A plant mixer is used to preshrink concrete, partially mixed or completely mixed. Quality and costs are two principal considerations behind the erection and operation of a central mixing plant. A producer who is running materials through his mixer every 45 sec. is merely trying to handle bigger payloads in his truck mixer equipment. Such an operator is not quality minded, but is certainly cost conscious. At an efficient mixing plant an operator is more than cost conscious; he has also established controls necessary to assure the production of consistent quality concrete. Whether preshrinking or central mixing, operating practices should be standardized and mixing routines



Convenient batching controls and communication facilities help to speed up operations

closely followed. Dependent on the comparative efficiency of each plant mixer, concrete of a given class should always be mixed the same length of time.

In preshrinking, it takes seven or eight revolutions of the mixer drum to shrink materials and another five to eight revolutions to approximate the desired slump. Such control should be established over each mixer load before the concrete is discharged into the agitating carrier. Altogether, a preshrinking cycle of $1\frac{1}{4}$ to $1\frac{1}{2}$ min. is required. On each and every load the same preshrinking cycle should be followed and similar controls should be placed over drum speed and mixing time of the agitator on the way to jobs.

Complete mixing at the plant requires, (1) close control over moisture content and gradation of the aggregates, (2) accurate weighing procedures, (3) water and other materials (which are ribbon fed) should be charged into the mixer on a given sequence, the efficiency of which has been proved by careful study, and (4) mixer should be rotated at a given speed for a given length of time. On busy days or slow days the same time must be used for each mixing cycle; speeding up can only be accomplished at the expense of quality. For careful inspection of each load before it leaves the mixer the operator should be so positioned that he is able to visually inspect each load before discharging it. If at all possible, the mixer should be equipped with an accurate slump determinant, otherwise slump cone tests should be regularly made as a check upon the operators' judgment, and at all times, mixer must be kept relatively clean, thoroughly lubricated and regularly

maintained. On such acts depend the efficient operation of the mixer and accurate performance of the slump determinant.

Wattmeters to Control Slump

At our plants, we operate four tilting mixers, two each of different makes. All the mixers are 3-cu. yd. units, in which we mix a maximum of $3\frac{1}{2}$ cu. yd. of concrete. An electric timer controls the length of the mixing cycle. Under no condition is an operator permitted to discharge a load before the "set" time has expired. At three plants, we use a $2\frac{1}{2}$ -min. mixing cycle; at one plant, a 3-min. cycle. Timing begins with the charging of each load. As charging is completed in slightly under $\frac{1}{2}$ min., our minimum mixing cycle with the whole load in the mixer is 2 min. We believe it takes a 2-min. mixing cycle to thoroughly mix 3 cu. yd. of concrete, carefully feed water to reach a desired slump and develop small, stable fortified air bubbles which make possible the delivery of quality concrete in either revolving or dumping carriers.

Our four plant mixers are equipped with electrical slump determinants. These determinants are so sensitive that they react accurately to the addition of 5 lb. of water; this means control within $\frac{1}{2}$ in. of slump. It has been a real struggle to gain such control. It takes constant supervision and determined personnel to continually hold consistencies within such close limits. For any slump determinant to work efficiently, mixer loads must be of approximately the same weights, aggregates must be similarly well graded, moisture contents must be compensated, set mixing times es-

tablished and entrained air brought under close control.

During the last eight years, we have spent a good many dollars and considerable time experimenting with slump control facilities. In two of our mixers, we formerly used the plastograph, a tool which was most helpful in controlling slumps in the low range—from no slump through 3 in. On slumps from 4 in. through 7 in., we were unable to consistently obtain accurate readings. In 1948, cooperating with a mixer manufacturer, we undertook to obtain control over consistency by means of a wattmeter.

After several years of experimentation, we determined that on batches of given uniformity (gradation and weights) a wattmeter of proper sensitivity could accurately gauge the consistency of plastic concrete. Such meters now determine the consistency of each load of concrete processed at our four plants. This equipment is doing a very good job. If a load of concrete mixed 2 min. and having a wattmeter reading of 230 is found on the cone test to have a slump of 4 in., succeeding loads of similar proportions, mixing time and readings will have a 4-in. slump, $\pm \frac{1}{2}$ in. We believe that such a meter can be effectively used in any tilting type mixer, processing plastic concrete. We have had no experience with dam type concrete and make no recommendations covering such work.

A wattmeter determines the power required to mix a batch of concrete. Before the load is shrunk, power demand is at the maximum. As the concrete becomes more fluid, less resistance is offered to the passage of the mixing blades through it. Power requirements drop off. As water is added, proportionately lower readings are recorded. The mixer operator continues to add water until he gets the reading that fits the required slump. Such final tempering of the concrete is completed easily within the 2-min. mixing cycle.

Due to the irregular drag produced by the mixer's blades passing through the concrete, readings will waver somewhat during the mixing. To get accurate results, a mixer operator should always use the reading established by the needle at the same end of its swing.

At our plants, we use a regular wattmeter connected into the power line, feeding a 40-hp. motor operating on 440 volts. The wattmeter is hooked up with a pair of 30 to 5 current transformers to get a 1 to 6 relationship which, proved by experience, gives the desired sensitivity for our 3-cu. yd. mixers. We protect the wattmeter against the start of each mixing cycle by short-circuiting the secondary of the transformers.†

All operators of tilting plant mixers can make effective use of this relatively inexpensive instrument. A competent local electrician can quickly provide the necessary equipment, all hooked up, ready to go to work.

In a few days, correlations can be made with cone tests to earmark readings on the wattmeter that will give you close control over all your regular mixes. Within a very short period, you will learn to standardize upon other readings that will cover special mixes and parts of loads. Soon you will be able to determine the slump of all your concrete before it leaves the mixer. This is the most feasible way to assure the processing of consistent quality concrete.

A discussion of plant mixer operation would not be complete unless a few words were said about maintaining the inside of the drum and the mixing blades. These must be protected against abrasion and wear. The inside facing of the drum should be given a hard coating treatment or should be lined with plates which have been hard coated. The blades of the mixer definitely should be hard coated and the condition of the blades should be regularly inspected.**

Controlling Cement Losses

Effective controls over cement, the most costly as well as the most important ingredient in concrete, are necessary if your concrete is to meet specifications and your cubic yard costs are to be controlled within reasonably close limits. We buy bulk cement by the truck load or carload. On purchases, one weighing takes care of a full load. In our concrete sales, we weigh out comparatively small quantities of cement. A small shrinkage is possible on each weighing operation.

In handling 100,000 bbl. of cement during a year's operation, one ready-mixed concrete company experienced a 5 percent shortage. At prices then prevailing, this represented a \$12,000 loss in cement inventory.

Take these steps to protect yourself against the possibility of sizable cement losses:

1. Provide adequate equipment, properly protected, to handle cement deliveries.
2. Regularly spot check cement shipments.
3. In weighing operations, use a two-speed conveying system (conveyor or Airlide) to charge cement weigh hopper. Dribble feed near end to hold weights within close tolerances. Provide a separate hopper and scale combination to get fast, accurate weighing of cement.

**Hard facing of transit mixer drums is never done. Even the blading comes without such protection. Substantial savings will be realized if hard facing the outside 3 in. of the top side of each blade is made a standard maintenance practice.

†Other size mixers with larger or smaller motors and other voltages will require different size transformers to attain desired sensitivity. For example, a 3-cu. yd. mixer, operating on 220 volts, will require 60 to 5 current transformers. A 5-cu. yd. mixer, using a 60-hp. motor will require approximately 50 to 5 current transformers for 440 volts and 100 to 5 for 220-volt operation. Your job is to determine the relationship which gives the desired sensitivity.

4. Carefully study weighing operations. Put a stop to either underweighing or overweighing. Do not tolerate discrepancies in either direction. Insist upon a break even arrangement. Tell your weigh men that if they go 25 lb. over in one weighing operation, they must go 25 lb. under in a following operation. A small downward adjustment to compensate for a small overload is fair to the trade and fair to the ready-mixed concrete operator. With your weigh men, stress the seriousness of their responsibility to the customers as well as to you.
5. Provide scales that will constantly operate within specified limits of accuracy. Balance them daily.
6. Check your scales regularly. Have them checked at least twice a year by competent scale servicemen, or whenever their efficiency is questioned.
7. Maintain daily, weekly and monthly comparisons between cement received and that weighed out in concrete. If discrepancies appear, immediately get to the core of the trouble.

Some operators have reported to us that their cement handling practices are such that gains in cement inventory always develop. We believe such practices to be unsound. It is our thinking that gains do not always develop unless customers are regularly being short changed. Constantly attempt to hold both shortages and gains within close limits. Your pocketbook cannot stand sizable losses; your reputation will soon be gone if your concrete doesn't contain the specified amounts of cement.

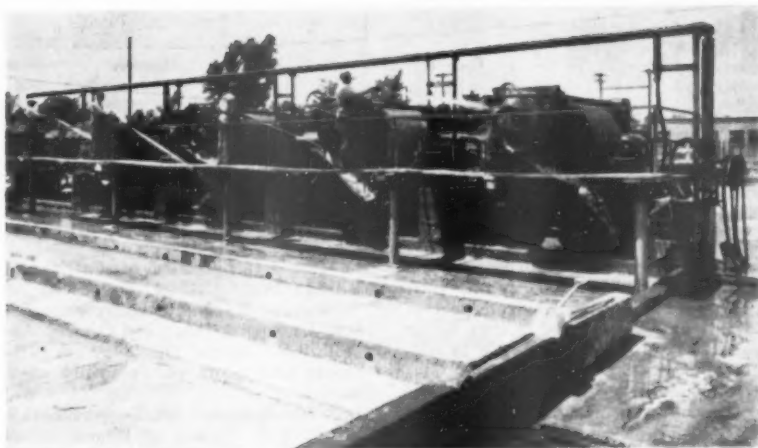
We have been informed by several operators that, through black market practices, they have suffered losses in cement inventory. These producers report that drivers of cement hauling equipment have been guilty of partially discharging some of their loads elsewhere.

Consider these moves to protect your operation against such a development:

1. If cement is shipped in bags, count them.
2. Clock a driver's unloading time.
3. Spot check a shipment by putting the cement hauling unit on a truck scale.
4. Notify the cement supplier of your suspicions.

What About Plant Expansion

A major operating problem, confronting many producers, is what to do about expansion. The temptation of a big job and a number of peak demand days quickly build up the pressure to expand. If present facilities are clearly inadequate and you can count on an increased volume of profitable business over a long period of time, expansion should be given serious consideration, especially if you are fortunate enough to have



Proper cleaning of transit mixer trucks at the end of the day keeps equipment functioning efficiently and reduces maintenance

both good operating personnel and a fat pocketbook.

Certainly before investing in any additional capital assets, an intelligent operator determines the effect of such an investment on his operating cash, loan position, profit margin and break-even point. He roughly determines how many profitable operating days can be expected annually in which the added volume will be such that the new investment will readily pay out. He considers the problem of added fixed charges. He includes a factor of safety in his thinking so that he can trim overhead should volume show an unexpected decline. He makes certain that necessary additional cement will unquestionably be available.

He studies present operations. Does demand regularly exceed ability to deliver? Should leased hauling equipment be considered? Are operational bottlenecks causing the pressure? Can he speed up operations? Can he eliminate some unprofitable business to accomplish the same result? Would changing from central mixing to pre-shrinking do the trick?

If a study shows that he has been able to promptly service key customers, except on a comparatively few days, that certain changes will produce some speed-up in operations and that no decidedly upward swing in concrete sales is expected, it might be wise to go slow on expansion.

An intelligent producer realizes that when he takes on considerable new work or starts a new operation, he sets in motion a whole chain of effects: weak points appear; bottlenecks develop; and new problems arise. All must be faced. On the other hand, an expanded operation will develop many advantages. Operations will be more flexible. There will be fewer pile-ups at the plants. There will be added protection against downtime and breakdowns. Truck hauls will be shorter and more deliveries will be made daily with each unit. These conditions will lead to closer control over performances of the driv-

ers. Improved delivery service will lead to improved customer relations.

Such a producer knows that the proposed operation of another plant poses many questions. Has he, or can he get, competent personnel for supervision and operation? What supervisory changes are necessary? How can activities between plants be synchronized? What can be done about controlling idle time on slow days? Should the new plant be operated during the winter (or other slow period) season? How shall dispatching be handled? Shall customer orders be accepted at the new operation or shall one central department take and distribute orders?

Certainly, if benefits from the investment are to be fully realized, new operation, delivery and maintenance activities that develop as a result of the expansion program must be closely coordinated through the establishment of effective (inter and intra) plant and service routines. New and more complete control over inventories must be established. The possibility of running out of materials must be eliminated. Responsibility for ordering must be placed. Workers must be properly assigned. Determination must be made as to how customers' orders are to be handled and allocated. Decision must be reached as to quartering and servicing of delivery equipment. An answer must be found for the problem of back-tracking equipment between plants. The matter of slow days and slack periods must be considered. Work loads of plant, delivery equipment and operating personnel must be carefully studied and regularly adjusted.

New routines must be worked out to effectively control:

1. Personnel and truck assignments.
2. Origin of delivery.
3. Shipments of cement and aggregate.
4. Relations with order department.
5. Dispatching of trucks.
6. Handling of overtime deliveries.
7. Cooperation between plants.
8. Scheduling of maintenance work.

An expanded operation makes possible the processing of better concrete, improvement of customer service, and more profits for the ready-mixed concrete operator. Such possibilities can only be realized through careful planning and hard work.

Expanded Shale Meeting

THE EXPANDED SHALE INSTITUTE held its mid-year convention at Dallas, Texas, December 1-3, 1952. The meeting was attended by the directors and other representatives of the 12 member companies in the U.S. and Canada, who met to discuss and formulate the future policies of this newly formed organization which had met for the first time in St. Louis, Mo., in May, 1952. On October 1, 1952, a permanent office of managing director of the institute was established, to which Frank G. Erskine, formerly with the Washington office of the Portland Cement Association, was appointed.

S. Carl Smithwick, Smithwick Concrete Products, Portland, Ore., and president of the institute, presided at the Dallas meeting. Committee meetings, which occupied the greater part of the convention program, included the following: Budget and Finance, H. H. Allen, The Featherlite Corp., Dallas, Texas, chairman; By-Laws and Rules, Alex McVoy, Texas Industries, Inc., Dallas, Texas, chairman; Technical Problems, Cedric Willson, Texas Industries, Inc., chairman; and Promotion and Publications, Alex T. Mickle, The Featherlite Corp., chairman.

Policies and Practices of the institute were adopted and included the following: the incorporation of the Expanded Shale Institute under the laws of the state of Delaware, with its principal office at the Warner Building, Washington, D.C.; the adoption of an official insignia for use on letterheads, promotional matters, etc.; a substantial working budget as recommended by Mr. Erskine, placing considerable emphasis on research and dissemination of this information; extending cooperation of the institute to universities and organizations interested in lightweight concrete research; the conducting of fire tests; collection and correlation of technical information for the purpose of determining a uniform standard of quality; and the establishment of a speakers' bureau, composed of qualified representatives of member companies representing all geographical areas, to assist Mr. Erskine in accepting requests for programs featuring considerations of lightweight concrete.

W. Edward Barney, formerly (until his retirement) executive vice-president, Hydraulic-Press Brick Co., St. Louis, Mo., was honored by election to the board of directors as an honorary director.

An added feature was a trip through the 3-kiln plant of Texas Industries, Inc. Also included in the

(Continued on page 188)

FLY ASH

Its Effects When Used In Plastic Concrete and Concrete Products

THERE ONCE WAS A TIME when we were content to make concrete consisting of "a properly proportioned mixture of water, portland cement, fine aggregate and coarse aggregate." However, one day far in the past, an adventurous concrete producer added something to his mixture and was convinced that in one way or another he had improved his product. Since that day countless "admixtures" have been used for such varied tasks as the entrainment of air, the retarding or accelerating of set, the improvement of workability, etc. Many of these admixtures and the results they provide are familiar to most present day concrete producers. Naturally all of us welcome anything that enables us to make better concrete. Thus the announcement of each new "admixture" is greeted with the hope that it will actually perform as advertised. Unfortunately not all claims have been fulfilled, so a feeling of skepticism generally accompanies our wishful thinking. Sometimes it turns out that an agent performs satisfactorily in some situations and not so well in others. As a result, conflicting stories and claims are advanced, causing confusion and doubt as to the effectiveness of the agent in question.

An admixture which has aroused much interest in recent years is fly ash. There is a rapidly growing interest in the employment of fly ash and other pozzolanic materials, not only in dams and other mass structures where they have been used successfully for many years, but in ready-mixed concrete plants, block plants, pipe plants and in concrete highways.

Many fly ashes have been found to be highly pozzolanic; that is, while they are not cements by themselves, they do have the property of combining with alkalies such as hydrated lime to form insoluble cementitious compounds. The lime may be present as such or may be present as a by-product of a separate reaction such as is produced by the hydration of portland cement.

Fly ash is commonly defined as the finely divided residue resulting from the combustion of pulverized coal, which is transported from the boiler by flue gases. Most city ordinances require that a high percentage of this "dust" be collected by either electrostatic precipitators or mechanical collectors. Disposal of fly ash is a problem of considerable magnitude, the annual collection in the United States from both public utilities and indus-

trial concerns being reported to be in excess of 4,000,000 tons. While it is quite probable that a large portion of this output is not of quality which would be satisfactory for use in concrete, productive utilization of appreciable quantities of this otherwise waste material has been the subject of considerable research and development.

For those readers who are not at all familiar with fly ash, it is a very finely divided material, many of the particles in some fly ashes being spherical in shape. The fly ashes that are most useful in concrete are those with fineness about equal to or finer than portland cement. Color ranges from a light gray or tan to dark gray or brown depending upon the composition.

Fly Ash in Plastic Concrete

Not all fly ashes are suitable for use in concrete. A considerable amount of research and testing of many different fly ashes has been done by a great many investigators. In addition to the extensive work done by such pioneering organizations as the Detroit Edison Co., the Chicago Fly Ash Co. (representing the Commonwealth Edison Co.), G. & W. H. Corson, Inc., (which represents a number of eastern power companies), considerable important work has been carried out by the U.S. Bureau of Reclamation, U.S. Army Engineers, U.S. Bureau of Pub-

BECAUSE OF THE INCREASED INTEREST among ready-mixed concrete and concrete unit producers in the possible use of fly ash in their mixes, this general review was prepared from material submitted at the suggestion of the editors by the following parties who are closely associated with research and development in connection with the utilization of fly ash:

N. H. Withey, consulting engineer for the Chicago Fly Ash Co., distributor of Commonwealth Edison Co. fly ash.

L. J. Minnick, chief chemist, G. & W. H. Corson, Inc., Plymouth Meeting, Penn., now engaged in research and sales of fly ash for a group of eastern power companies.

E. L. Saxer, head of civil engineering department, and J. K. Selden, coordinator of housing research, Research Foundation, University of Toledo, who are currently engaged in research and testing of fly ash in concrete and in autoclaved products.

lic Roads, University of California, Kansas State College, University of Wisconsin, Marquette University, Toledo University, Portland Cement Association, several highway departments and many public utility companies.

A rather comprehensive publication of the U.S. Bureau of Mines, Information Circular 7635, entitled "Utilization of Fly Ash," by R. E. Morgan, presents abstracts of articles and investigation pertaining to the use of fly ash. Obviously, to attempt to incorporate the results of these investigations here, even in summary form, would be beyond the scope of this review. Rather, it is the purpose of this presentation to review the general effects on physical properties when good quality fly ash is incorporated in the concrete mix.

A comprehensive study of a wide variety of fly ashes from different parts of the U.S. was made at the University of California and published in a paper entitled "Properties of Cements and Concretes Containing Fly Ash," by Raymond E. Davis, Roy W. Carlson, J. W. Kelly, and Harmer E. Davis, Jr., *Journal of the American Concrete Institute*, May-June, 1937. These authors studied the effect of additions of fly ash up to 40 percent based on the weight of cement plus fly ash. A publication by H. A. Frederick in the *Proceedings of the A.S.T.M.*, Vol. 44, p. 810, reports results obtained when fly ash is used as a replacement of sand.¹ It is evident from these investigations that the strength of concrete is dependent upon the design employed which in turn is related to the characteristics of the fly ash (and also the other constituents).

A.S.T.M. Committee C-9 on Concrete and Concrete Aggregates is currently in the process of evolving a proper specification for fly ash as an admixture in concrete. Extensive cooperative research and testing work has been in progress for the past two years, and it is expected that a specification will be forthcoming in the near future, so that the increasing number of users of fly ash in concrete will have a guiding A.S.T.M. specification.

1. Other papers which might be listed referring to design of concrete containing fly ash are:

F. R. McMillan and T. C. Powers, *J. Am. Conc. Inst.* Vol. 34, p. 129

J. S. Nelles, *J. Am. Conc. Inst.* Vol. 12, p. 296

L. J. Minnick, *Tappi*, Vol. 32, p. 21

As previously mentioned, all fly ashes do not produce equal results in concrete. Generally speaking, those of low carbon content and relatively high fineness are the best. It is felt by many engineers that the carbon content should not exceed about 12 percent and the specific surface (Blaine) should be greater than 2500 sq. cm. per gram. The discussion of the effect on properties that follows concerns good quality fly ash when properly used in concrete mixes. It must be clearly kept in mind that the effects might not be at all applicable for fly ashes of inferior quality.

WATER REQUIREMENT

The use of fly ash will generally result in either a small reduction or no change in quantity of mixing water required per cubic yard of concrete for a given consistency or slump. With fly ashes that permit a reduction in water, this improvement is believed to be largely due to the extreme fineness of the material and to the presence of a considerable portion of spherically shaped particles which improves placeability; also, it has been contended that fly ash improves the grading of the cement fraction of the mix. For fly ashes with high carbon content, the water requirement is in some cases slightly higher than for comparable mixes without fly ash.

PLACING AND FINISHING QUALITIES

In concretes made without air entrainment, fly ash improves plasticity and cohesiveness of the mix and permits easier placing and finishing. The improvement is the greatest in lean mixes containing sand which is deficient in fines. In the latter case, fly ash can be used largely as a substitution for a portion of the sand, the cement content either remaining the same or being reduced if strength data indicate that this is permissible. In other words, in addition to its usefulness as a pozzolan, fly ash can be used as a filler material where the mix is deficient in fines.

In air-entrained concretes, this improvement in placing and finishing qualities is usually less evident because of the marked improvement due to the air entrainment itself; but if the mix is deficient in fines, the use of fly ash will improve these qualities in air-entrained concrete as well as in non-air-entrained concrete.

APPEARANCE

Fly ash concrete usually flows into forms more effectively than non-fly ash concrete. There is less vibration required, less bleeding, and upon removing the forms the surface is free of excessive cavities and irregularities.

The darker fly ashes generally cause a darkening of normal concrete. However, this darkening has frequently been found to largely or entirely disappear as the concrete ages.

STRENGTH

The addition (not substitution) of fly ash results in improved strength of concrete. Therefore, for many purposes a leaner mix may be used. Where the amount of fly ash is equal to the volume or weight of cement which has been removed from the mix (usually 20-25 percent), the strengths at ages up to about 28 days are generally lower. Due to the pozzolanic action of the fly ash, the later strength (6 months to 1 year) will be equal or superior to the non-fly ash mixture. The added strength that will be developed in concrete containing fly ash is largely dependent upon the quality of the fly ash, the cement content, the grading of the aggregates, the composition of the cement, and the design of the concrete mixture.

It has been generally contended that pozzolanic action is somewhat slower than cement hydration. However, by adjusting the design of the mix many fly ashes may be expected to increase the early strength of concrete. Or to state this another way: by using fly ash, concrete may be produced with lower cement contents that show 1 and 3 day strengths equal to the "reference" non-fly ash mix. The 28-day strengths of these mixtures will frequently show higher values for the fly ash concrete. In designing these mixtures a larger quantity of fly ash must generally be used than the amount of cement removed, the extra quantity of fly ash being compensated by a reduction in sand.

Frequently the erroneous statement has been made that proper strength gain of concrete containing a pozzolan cannot be expected unless the concrete is subjected to moist curing at room or elevated temperature. It has now been demonstrated by tests that the strength of concrete containing fly ash, relative to the strength of corresponding plain concrete, is about the same whether the storage is moist at 70 deg. F., air dry at 70 deg. F., or in molds at 45 deg. F.

PERMEABILITY

Water tightness, or the resistance of concrete to the passage of water, is markedly improved with the use of fly ash. A set of tests made with a good quality fly ash showed that concrete made with five sacks of portland cement and one sack of fly ash allowed passage of only about 15 percent as much water under a water pressure equivalent to a 60-ft. head, as did concrete containing six sacks portland cement and no fly ash.

HEAT OF HYDRATION

In mass concrete structures, concrete temperature rise due to heat of hydration of cement is important, and frequently is reduced by the use of cooling coils buried in the concrete. Lower heat of hydration, and hence a reduction in number of cooling coils required, can be accomplished with the use of fly ash in the mixture. Hungry Horse dam in Montana, a

project of the U.S. Bureau of Reclamation, is an example of a mass structure where fly ash (about 140,000 tons) was used in the concrete.

ACID ATTACK

Tests have been made to show that fly ash markedly improves the resistance of concrete to attack by sulfuric acid. In domestic sewers, concrete is sometimes exposed to such attack by contact of hydrogen sulfide gas with the wet upper surfaces. Also, tests have shown that fly ash improves resistance to sulfate attack, a useful feature when the concrete is exposed to salt action such as with sea water, etc.

CEMENT-AGGREGATE REACTION

In some parts of the country, the available aggregates have been found to be reactive with portland cement, causing delayed expansion and cracking of the concrete. Many investigations by government agencies and others have disclosed that the use of highly pozzolanic fly ash in the mix will materially reduce or prevent these deleterious reactions.

RESISTANCE TO FREEZING AND THAWING

It is well recognized that proper air entrainment is necessary for high resistance of concrete to frost action. All fly ashes contain a certain amount of carbon, some more than others, which is known to have a depressing effect on air. Therefore, the resistance to freezing and thawing may be expected to be reduced with the use of fly ash, especially if the fly ash has any appreciable amount of carbon in it unless a sufficient amount of air-entraining agent is employed to maintain the proper air content necessary for high frost resistance. This can and has been done very successfully, and where the proper air entrainment is maintained, tests have shown that fly ash concrete also has excellent resistance to freezing and thawing.

SHRINKAGE

The effect of fly ash on shrinkage has generally been found to be insignificant although some tests have shown a reduction in shrinkage with the use of fly ash.

Fly Ash in Concrete Pipe and Building Block

Many manufacturers of concrete pipe and concrete block are using fly ash as a part of their cementing material. The characteristics reported by these users, as compared with concrete made without fly ash are:

1. Equal or better plasticity and cohesiveness.
2. More uniform surface texture of products; sharper edges and corners.
3. Less sticking to molds or pallets in cases where this is a problem.
4. Equal or better strength.
5. Less abrasion of wearing parts.
6. Lower cost of materials.
7. Higher production rate (less loss, etc.).

Generally, in concrete products employing dry mixes, quantities of fly ash ranging between 15 and 25 percent by weight of the total cement plus fly ash have been used with success. Tests reported by O. Neil Olson of Marquette University in a paper entitled "Report of Tests of Effect of Some Admixtures on Physical Properties of Concrete Masonry Units" (a study in cooperation with the National Concrete Masonry Association), showed that for block containing 20 percent fly ash, the 28 day strengths were 112 percent and 96 percent (sand-gravel and cinder aggregates, respectively) of the control mix with no fly ash.

Fly Ash in Autoclaved Products

Fly ash can be used to advantage in autoclaved products since it reacts with both cement and lime in a high-pressure steam atmosphere. Large percentages of fly ash may be used in concrete block made with lightweight aggregates, with an increase in strength and decrease in shrinkage. Satisfactory lightweight aggregate units may also be produced with lime and fly ash, preferably with a little cement for green strength in the autoclave. Pressed or heavily-tamped block of straight fly ash-lime mixes with no coarse aggregate develop adequate strength but tend to be brittle. However, foam concretes of insulating or featherweight structural grades may be made with either lime-fly ash or cement-fly ash mixes without aggregate. Research under way at the National Bureau of Standards, Toledo University, G. & W. H. Corson, Inc., and elsewhere, indicates commercial possibilities for this product.

Handling of Fly Ash

Ready-mixed concrete producers, products plants and contractors handle bulk fly ash in the same types of equipment used for portland cement. In the dry state, fly ash flows freely, but it is readily conveyed by bucket elevators, screw conveyors, provided with positive shut-offs, Airslides or pneumatic pump equipment. In ready-mixed concrete plants, frequently the same handling equipment is employed as is used for the cement, merely using one of the existing cement hoppers for fly ash rather than cement, or by addition of a hopper or bin for fly ash, the weighing being done with the same weigh batcher as used for the cement. In such installations extreme care should of course be taken to insure that mix-ups of fly ash and cement do not occur. Fly ash is somewhat lighter in weight than cement; therefore the speed of a bucket elevator should not be too fast, although the speeds normally used for cement will generally be satisfactory for fly ash.

Since fly ash is a continuously-formed by-product from coal burning boilers, its cost is very low relative to that of a manufactured prod-

uct such as portland cement. Its use as an admixture in concrete will result in considerable cost saving due to the lower cement requirement, an important factor that is of much interest to every one of us. As previously pointed out, fly ashes differ considerably in their effectiveness in producing strength. Therefore the exact economy must be determined not only from a knowledge of how much of the fly ash is required in the mix to produce the desired strength with a given reduction in cement factor, but also from the delivered price of the fly ash, cement and sand in question. Finally it should be stressed that when planning to use fly ash in concrete, it is absolutely essential that the mix be designed by a competent technician using the particular fly ash and other materials which are to be used on the project.

Expanded Shale

(Continued from page 185)

field trip were visits to several large commercial and industrial buildings and warehouse structures using considerable amounts of expanded shale aggregate in structural concrete and masonry units. As stated by Mr. Smithwick, Dallas leads the nation in the variety and extent of the uses of expanded shale concrete. The 42-story Republic Bank building, now under construction in Dallas, is constructed of expanded shale concrete throughout except for the steel framework.

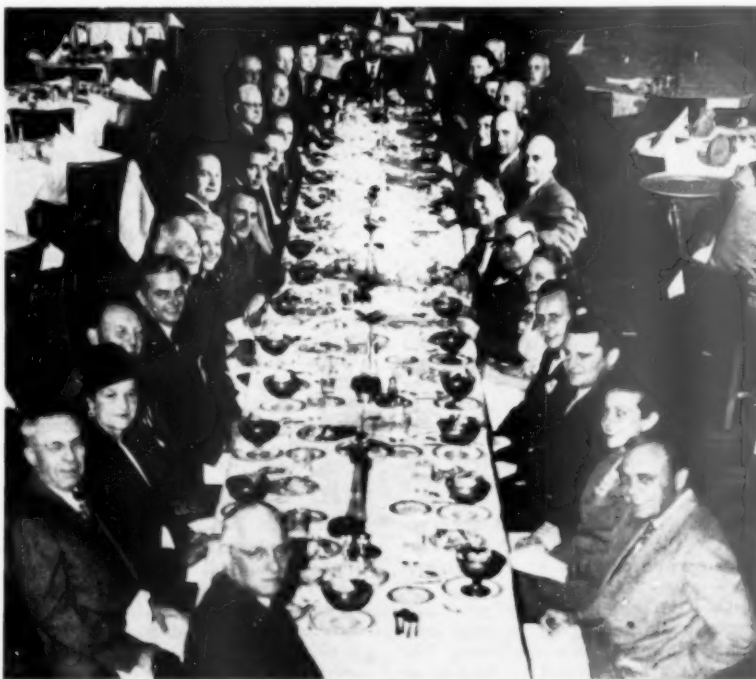
Hosts for the Dallas meeting were The Featherlite Corp. and Texas Industries, Inc. The next annual meet-

ing of the institute will be held in Kansas City, Mo.

The following members were present at the Dallas meeting:

H. H. Allen, The Featherlite Corp., Dallas, Texas
W. W. Allen, Hydraulic-Press Brick Co., St. Louis, Mo.
W. W. Allen, Jr., Hydraulic-Press Brick Co., South Park, Ohio
W. Edward Barney, honorary director, Expanded Shale Institute
George Bickel, The Featherlite Corp., Dallas, Texas
J. Murray Black, John H. Black Co., Buffalo, N.Y.
I. F. Brettell, The Cooksville Co., Ltd., Toronto, Canada
Mahlon B. Christie, Light Aggregates, Inc., Rapid City, S.D.
J. Henry Davis, The Featherlite Corp., Dallas, Texas
Frank Erskine, managing director, Expanded Shale Institute, Washington, D.C.
Otto C. Frei, Smithwick Concrete Products, Portland, Ore.
George W. Kuhavy, Carter-Waters Corp., Kansas City, Mo.
Ray E. Lemley, Light Aggregates, Inc., Rapid City, S.D.
Joseph McElroy, The Featherlite Corp., Dallas, Texas
Alex McVoy, Texas Industries, Inc., Dallas, Texas
Alex T. Mickle, The Featherlite Corp., Dallas, Texas
B. F. Park, Buildex, Inc., Ottawa, Kan.
William E. Poston, Jr., Poston Brick and Concrete Products Co., Springfield, Ill.
Ralph B. Rogers, Texas Industries, Inc., Dallas, Texas
W. Chester Smith, The Cooksville Co., Ltd., Toronto, Canada
S. Carl Smithwick, Smithwick Concrete Products, Portland, Ore.
Allan P. Taylor, Kentucky Light Aggregates, Inc., Louisville, Ky.
William H. Thomas, McNear Brick Co., San Francisco, Calif.
A. R. Waters, Carter-Waters Corp., Kansas City, Mo.
Cedric Willson, Texas Industries, Inc., Dallas, Texas
J. Henry Young, The Featherlite Corp., Dallas, Texas

FOSTER SAND & GRAVEL Co., Anaheim, Calif., has opened its sixth concrete and building materials plant at Garden Grove, Calif.



Delegates and guests attending banquet at Dallas Athletic Club at which Texas Industries and The Featherlite Corp. acted jointly as hosts

1953 JAEGER "MIX PLUS" model 3HM-D



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Perfected "Comatic" hydraulically actuated transmission, improved transmission mounting and closer coupled intermediate drive insure no deflection over the roughest ground both on and off the road. Improved A frame and drum roller supports carry maximum drum loads.

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cement blow-back and water spillage when charging, and loss of concrete when climbing grades. *Backs away* instantly and completely from the drum for unimpeded discharge. Sealed end loader also available, if desired.

"Dual Mix" drum produces higher strength concrete because of correct diameter-to-length ratio, continuous spiral mixing blades and exclusive throw-back blades. Built for 8 to 10 years service compared with the 4 to 5 years life of cheaply built mixers.

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Wisconsin Meeting

(Continued from page 177)

An expert in the audience Paul Woodworth of the Waylite Co., Chicago, Ill., gave his views concerning strength requirements. A.S.T.M. provides for two grades of units, he said: grade A (1000 p.s.i. strength) and grade B (750 p.s.i.). He felt that the 1000 p.s.i. requirement was excessive, and that 900 p.s.i. block would withstand 100 cycles of freezing and thawing. Clay materials, he pointed out, only have to withstand 50 cycles of freezing and thawing. The grade B block coated with portland cement paint or stucco is considered as durable as untreated grade A block.

Two talks during an afternoon session were devoted to outlining methods of increasing concrete masonry sales. S. H. Westby, manager, Housing and Cement Products Bureau, Portland Cement Association, Chicago, Ill., told what his organization is doing to promote concrete block sales, and suggested ways in which individual producers could tie in promotional efforts with the P.C.A.'s extensive program. The other speaker was E. B. Saltz of the Milwaukee Journal who outlined a cooperative advertising program for the Wisconsin association. This proposal set in motion the greatest debate of the convention.

The form of an advertisement would be an eye-catching picture or slogan,

with each participating company listed by area. This, Mr. Saltz said, would accomplish two things: it would enable an individual to participate in a large ad which he couldn't afford himself, and would tell prospective customers where they might buy the product.

Ray Minette led the discussion of the proposed advertising program. Many interesting and important details developed when the members studied the proposal carefully. Would a Milwaukee producer who gets 90 percent coverage by newspaper in his area (assuming a Milwaukee newspaper were used as the medium) pay the same amount as an outlying town with 53 percent coverage by newspaper? Would it be better to spend this money for local newspaper advertising? How should an advertising program be financed?

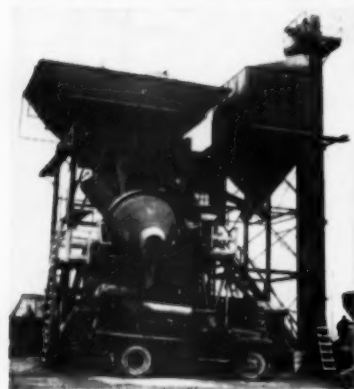
Many of the questions that arose will await further study, but the membership voted overwhelmingly in favor of initiating an advertising program, getting it underway immediately by levying a special assessment on all members of 30 cents per 1000 block for half of each producer's 1952 production. This will not initially be prorated according to newspaper coverage in outstate (out of Milwaukee) areas. The advertising program will be continued by collecting from each producer 30 cents per 1000 block manufactured.

Other talks heard during the two-day meeting included a review of state trucking regulations as they affect a concrete products producer, by Dan F. Schutz, Motor Vehicle Department, State of Wisconsin; employer-employee relations, discussed by Lynn Surles, Marquette University, and "The American Way—What is There In It For Me?" given by Henry H. Talboys, Nordberg Manufacturing Co., Milwaukee.

The state trucking regulation principally discussed by Mr. Schutz was the ton-mile tax. Concrete block are not exempt from this tax, he said, unless transportation is confined entirely within a town, village or city and adjoining towns, or unless delivery is made to a farm for a building to be erected for a farming pursuit. Ready-mixed concrete trucks have an advantage over concrete masonry trucks—the former is classified as a "dump body" and is exempt from the ton-mile tax for a haul not to exceed 20 miles from the point of loading. Mr. Schutz reviewed the weight limits and described the penalties for overweight trucks. The penalties can be quite stiff—for an overload over 5000 lb., the penalty is 10 cents per lb. It was brought out that clay products are wholly exempt from the transportation tax, giving those producers an unfair competitive advantage.

A cocktail hour and banquet were held the evening of the first day. A floor show was acclaimed one of the best ever presented. This was followed by dancing.

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PROMPT DELIVERY.

Write for Catalog A-339.

BAUGHMAN MFG. CO., INC.



1121 Shipman Rd.
Jerseyville, Illinois

CONVEYORS

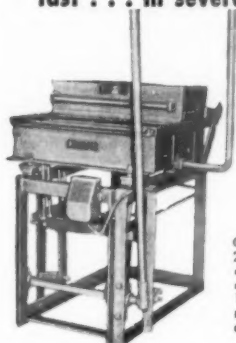
Move MORE materials at LESS cost!



Model 230

make **\$200** profit per day
with new **RAINBOW ROCK MACHINE**

new building materials machine makes modern slump brick
fast . . . in several sizes, colors . . .



cash in with this new
machine . . . fully guaranteed
only **\$750** fab factory
compl. With Motor

Capacity of 1500 beautiful concrete slump bricks daily,
24" long, 3 1/2" wide . . . 1 1/2", 2 1/2" or 3 1/2" thick. Steel
all-welded high speed machine operates easily, indoors
or out, with wood pallets of 2x4 lumber. Complete with
1 HP elec. motor, or powered by gasoline engine. Needs
no special skill, simple operating instructions and valu-
able mixing formulas included.

send for free literature today

Act Now For This Sensational Buy! Big Profits!
Limited Number Available For Immediate Shipment!

Fireplace of
sensational new
Rainbow Rock, one
of the many
luxurious effects
with this versatile
new building brick.



no cost for individuality!
labor cost cut 1/3!

The demand for exciting new Rainbow
Rock is terrific. It's modern, practical, eco-
nomical. Its many fade-proof pastel colors
create desired individuality without extra
expense. Sized larger than ordinary brick
and easier to lay up, attractive Rainbow
Rock cuts labor costs by one-third. And so
many uses! Interior and outer walls,
chimneys, fireplaces, steps, driveways,
garden walls, walks, breezeways and
garages. You can make it in several dis-
tinctively textured faces, perfect for latest
building trends.

GENERAL ENGINES CO.

Dept. RP-23, 307 Hunter St., Gloucester, N. J.

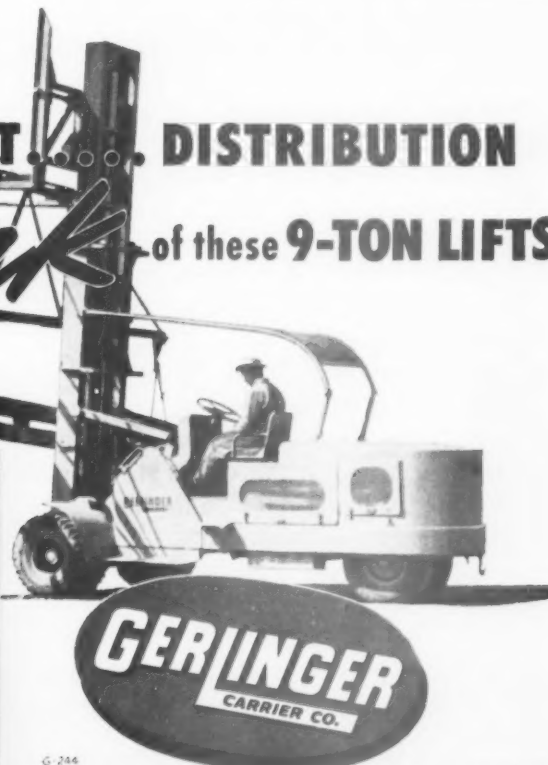
GERLINGER'S
COUNTER-ACTIVE WEIGHT DISTRIBUTION
Makes *Easy Work* **of these 9-TON LIFTS**

Seattle Concrete Pipe Co. is manufac-
turing pre-cast concrete beams that
weigh ten tons and are forty feet long.
Moving these cumbersome units
about the plant proved an easy job
for their 9-ton Gerlinger Lift Truck.

Talbot Campbell, president, says,
"Our Gerlinger Lift Truck does a very
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have had a very low upkeep expense
on this lift truck during the time we
have owned it."

The balanced weight distribu-
tion of a Gerlinger Lift Truck
makes it particularly ideal for
such off-size lifts. 54% of the
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needed

—over the front wheels
—for maximum traction and
easy maneuverability. This is
just one of the many exclusive
job-proven features that en-
able Gerlinger Lift Trucks to
out-perform all others in the
most rugged handling jobs.



GERLINGER CARRIER CO. DALLAS, OREGON



COLUMBIA'S LATEST... the **Block Splitter**

TRIED, TESTED, PROVEN, the New Columbia Block Splitter proudly takes its place in the Columbia line of machines for the block-making industry. The new Columbia Block Splitter, like all other Columbia machines, combines compact, sturdy, precision engineering and economical operation with a low capital investment.

Easy portability, 8-inch and fractional cutting capacities, and many other improvements make the Columbia Block Splitter a valuable addition to your plant operation.



Write today for complete information.
Sales and Service throughout the world.

Columbia MACHINE WORKS
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... in Portland Cement Association advertisements month after month. These ads, many in rich, natural color, appear in leading national magazines that are bought and read by millions of house-conscious readers. They:

- 1 Tell of the beauty, economy and structural advantages of concrete masonry.
- 2 Create a real desire and preference for a concrete masonry house.
- 3 Send local prospects to you for more information and assistance.

That's where you take over. When a PCA ad appears mention it by page and magazine in your own newspaper, television, radio or direct mail advertising. Explain that your plant is headquarters for concrete masonry construction. Invite prospects to call for information and help in planning their houses.

When a prospect calls show him photos or take him to see attractive concrete masonry houses. Show him plans or tell him where to get them. Give him names of architects, builders and lending agencies experienced in designing, building and financing concrete masonry houses.

You'll find that tying-in with PCA ads and following through with service of this kind helps you get more business.

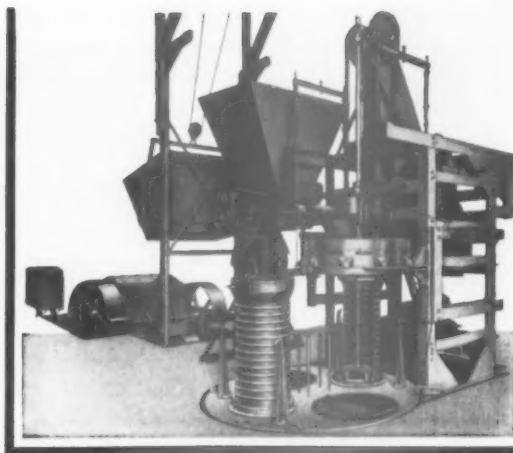
PORTLAND CEMENT ASSOCIATION

33 West Grand Avenue, Chicago 10, Illinois

A national organization to improve and extend the uses of portland cement and concrete... through scientific research and engineering field work

You Can't Match McCracken FOR CONCRETE PIPE PRODUCTION

1. Doubles production in all sizes 4" to 36".
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3. Does twice the business with half the inventory.
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7. A wide range of sizes with lowest costs in every size it makes.
8. More resales—you can't sell a lemon to the same man twice.



MODEL "T" (Pictured Above)—4" to 36"; MODEL "B"—4" to 18";
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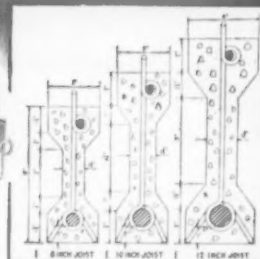
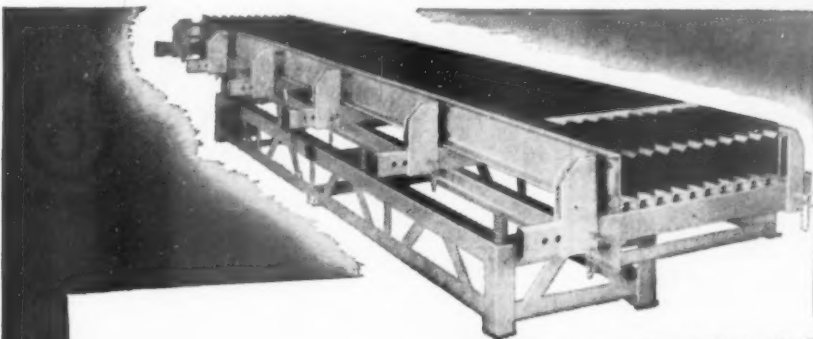
WRITE FOR COMPLETE INFORMATION TO DEPT. CPS
at any of the following addresses:

Eastern Representative
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211 East 149th St.
New York 51, N. Y.

Central & South American Agent
George W. Hoffmann
Apartado Postal 1173
Mexico, D. F.

MAIN OFFICE AND FACTORY, SIOUX CITY, IOWA

CONCRETE PIPE MACHINERY CO.
SIOUX CITY, IOWA



... ADD A NEW PROFIT-MAKER! INCREASE YOUR VOLUME

Only small
investment required!

The addition of the Kirk & Blum Vibrating Table to your present equipment requires a very small initial cost, enables you to make an entirely new line of 8", 10" and 12" joists in 20 and 24 ft. lengths.

Produce money-making concrete joists with the
Kirk & Blum Heavy Duty Vibrating Table . . .

Cash in on the ever-growing demand for steel-reinforced concrete joists. Your experience and contacts in the building trade should make it easy to build up a profitable business in this new line. Concrete joists are simple to make, have unusual strength, are termite proof. The KIRK & BLUM Type "S" Heavy Duty Vibrating Table is capable of multi-production of concrete joists, allowing a fine profit-margin. Easily produced by unskilled operators. For complete details and prices, write to The Kirk & Blum Mfg. Co., 3210 Forrer Street, Cincinnati 9, Ohio.

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Manufacturers of steel forms of all
types . . . Curb, Gutter, Sewer, Road

It's FLEMING — for High Quality — Low Cost.

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Completely Automatic
PLAIN PALLET
Concrete Block Machine

Combines PRESSURE with HIGH-SPEED VIBRATION



Only One Man is Needed

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Concrete Block Plants engineered to your individual specifications.

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COMPLETE CONCRETE BLOCK PLANT EQUIPMENT

SOFFIT BLOCK

(Filler for Floors and Roofs)

Opens Up New Markets

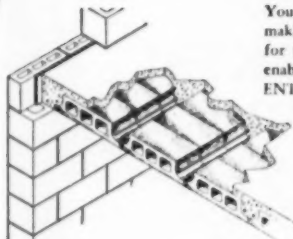


- FIRESAFE
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- RIGID
- ECONOMICAL

Gives FLOORS and ROOFS
Lifetime Permanence ...
Cuts Construction Costs!

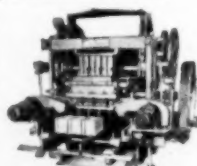
Your profits will greatly increase by making and selling Soffit Filler Block for floors and roofs. Soffit Block enables your customers to make an ENTIRE structure firesafe and permanent, and do it economically.

Illustration at left shows integral joist and slab of reinforced concrete. Meets standard building code requirements. Recommended by architects and builders.



BESSER VIBRAPAC

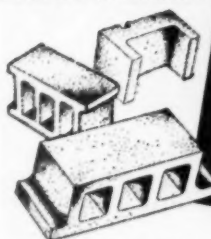
Soffit Filler Block are made on the same machine that produces quality concrete load-bearing block for walls, in all styles and sizes, using one set of Plain Pallets. Write for literature and names of Vibrapac plants making Soffit Block.



BESSER MANUFACTURING CO.
ALPENA, MICHIGAN, U. S. A.
Complete Equipment for Concrete Products Plants

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LIGHTWEIGHT AGGREGATE...



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BESLITE reduces weight, increases sound and heat insulation, resists fire, freezing and thawing, WITHOUT any sacrifice in concrete strength. Lightweight BESLITE concrete cuts building and shipping costs . . . its light color, textured surface gives new beauty to exposed masonry. BESLITE, in two sizes . . . 1/2" to #4 and minus #4, is available by train, truck or barge within 200 miles of Marietta, Ohio. Made by, sold by, The Marietta Concrete Corporation, leading producer of concrete storage systems for farm and industry.

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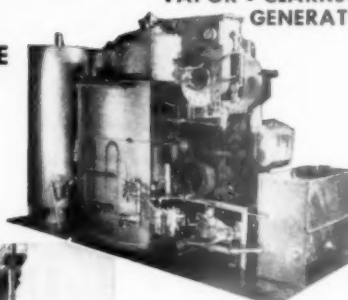
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GET A "Kwik-Steam"

LITTLEFORD

VAPOR • CLARKSON GENERATOR

for your
• BLOCK • PIPE
or
• READY-MIX
PLANT



"Kwik Steam" Generator is the fastest steam producing unit ever designed. You get steam in 2 minutes time from a cold start. "Kwik-Steam" Generators are used to heat aggregate and water at proper temperatures and produce extra steam for warming stock piles and equipment for Ready Mix Concrete Plants. This unit delivers steam only when steam is needed. The slow, troublesome steam boilers cannot supply steam for modern high-speed production. "Kwik-Steam" Generators are low cost operating, using fuel oil or gas as fuel, are completely automatic and are made in sizes ranging from 28 to 185 BHP.



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At Ceredo, West Virginia, The Union Concrete Pipe Company installed this AMERICAN No. 9 Grinder to work on acres of cinders. Results? 30 yards of minus $\frac{3}{8}$ " aggregate . . . every hour, every day.

WHAT VOLUME OF GROUND CINDERS DO YOU NEED?

Select from 8
AMERICAN Grinders
Hourly Output 4 Yards
to 75 Yards!

Write your own ticket for your plant's cinder-grinding requirements . . . one of the 8 AMERICAN Grinders will give you the output needed . . . deliver minus $\frac{3}{8}$ " mesh aggregate without additional separation! Your AMERICAN Grinder will require minimum maintenance . . . will conserve power . . . will help produce low-cost, top-quality cinder block. Write . . . wire . . . phone . . . ask for an AMERICAN grinding expert to help you lick your problem.

CAPACITIES . . . YDS. PER HOUR

No. 5 4	No. 9 30
No. 6 6	No. 482 35
No. 7 12	No. 418 50
No. 8 20	No. 384 75

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BUCYRUS, OHIO

CONCRETE BURIAL VAULTS

AMERICA'S FINEST MOLDS AND LOWERING DEVICES



TERRITORY FRANCHISES
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COLORS

SYNTHETIC CONCENTRATED

Red Blue
Yellow Brown
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Factory: Bethlehem, Pa.

Priced for TODAY...Designed for FUTURE Expansion

THE *Columbia* BASIC GROWS WITH PRODUCTION DEMANDS

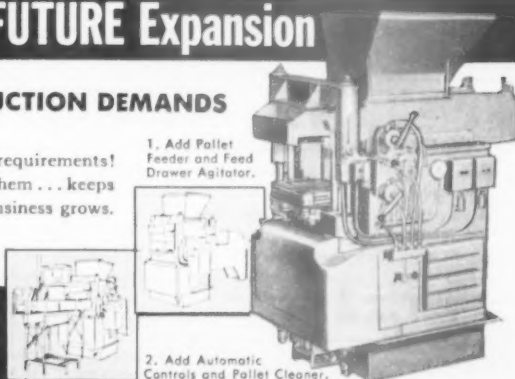
This low-cost block machine keeps pace with your production requirements! Add the famous Columbia Automatic features as you need them . . . keeps initial investment down but meets production needs as your business grows. Write for complete details today!

Fast Sales, Installation and Maintenance Service to all parts of the country!



Columbia MACHINE WORKS

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CLASSIFIED ADVERTISEMENTS

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8 - 2 yard High Dump Ready-Mix Trucks mounted on late model chassis. All overhauled, painted, in good condition. Priced to sell. Will finance.

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ZENIA P.O. BOX 173 OHIO

FOR SALE

Complete cement block making plant located in Detroit, Michigan. This includes a Stearns No. 9 Jolterete in very good condition, with 4"-8"-12" attachments. 8" attachments are new. Plenty of pressed steel pallets all sizes, mortar grooved. Modern steel racks. 28 ft. mixer with batcher, skip loader, gravel bins. Clark platform lift truck. Priced for quick sale, as owner leased property. We are compelled to sell. Can be bought as a unit or separately, subject to prior sale. BOX L-37, CONCRETE PRODUCTS, 309 W. Jackson Blvd., Chicago 6, Ill.

FOR SALE \$25,000.00

COMPLETE BLOCK PLANT, LAND, BUILDINGS AND EQUIPMENT. PLAIN PALLET MACHINE, 2300 UNITS PER DAY. RACKS, PALLETS, OFF-BEARER, MIXER, 5 CAR SIDING, 3 TO 3 CAR STORAGE HOPPER, OVERHEAD BINS, CONVEYORS, 2 STEAM ROOMS, AUTOMATIC BOILER, TRUCKMAN, HYSTER FORK LIFT TRUCK, FORD DELIVERY TRUCK, AND OTHER EQUIPMENT. PLANT 7 YEARS OLD. BUSINESS IS A PARTNERSHIP. YOU MAY BUY ALL or 1/2 OF BUSINESS. I HAVE OTHER OUT OF STATE BUSINESS INTEREST. PICTURES ON REQUEST.

ATLAS CONCRETE PRODUCTS CO.
Route 5 — Phone 62429, High Point, N. C.

FOR SALE

- 1 Korpak Block Machine, 8 and 12 inch mold.
- 1000 eight inch pallets, 100 twelve inch pallets.
- 20 Fifty Block Racks.
- 1 Dunn one bag capacity overhead mixer with hoist.
- 1 Hand Jack
- 1 Lintel Mold.
- 1 Home built fork lift truck.

All machinery is open to offers in whole or in part. Write Cerone Cement Block Co., 1300 Auburn St., Whitman, Mass. Phone Brockton 3171-M.

FOR SALE

No. 9 Stearns Jolterete with dual vibrator, power carriage, boom and air hoist with 4", 8" and 12" attachments. 4", 8" and 12" pallets, 40-72 block racks. Can be seen in operation now. Dunn Brick Machine with pallets, racks and skip hoist. Fairbanks-Morse Coal Stoker for 25 H.P. boiler. Barrett-Cravens electrically operated power on lift truck with extra battery and charger.

All items priced for quick sale.

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Phone 51313

USED MACHINERY

LOCATED IN ALL PARTS OF THE UNITED STATES

- 1—Factory Rebuilt Semi-Automatic Columbia Model #8
- 1—Factory Rebuilt Fully-Automatic Columbia Model #8
- 1—Lith-I-Bloc — Block Machine — Offbearer — Compressor
- 1—Stearns Jolterete #7-4 years old-4" & 8" Molds, Pallets
- 2—Brikrete Machines—Mixer, Skip Loader
- 2—Flemings #180 Automatic—Rebuilt-4", 6" and Flue attachment.
- 1—Jackson Church Brick Machine (like new) with 18 cu. ft. Besser Mixer.
- 2—Kirkham Vibrator Block Machines.
- 2—Appley Machines—Skip Hoist, Mixer Molds and Pallets
- 2—Stearns #9 Complete with 4" and 8" Pallets.

TERMS:

WRITE FOR LOCATION OF INDIVIDUAL MACHINE OWNER
COLUMBIA MACHINE WORKS
107 South Grand Avenue
VANCOUVER, WASHINGTON

EQUIPMENT FOR SALE!

STEARNS #9 Jolterete.....\$2500.
STEARNS #7 Jolterete..... 2000.
STEARNS 18 cu. ft. Concrete Mixer 750.
STEARNS 28 cu. ft. Concrete Mixer 1500.
STEARNS 18 cu. ft. Skip Loader... 750.
STEARNS 42 cu. ft. Skip Loader... 1500.

Largest Stocks of Pallets in the World.
Send tracing or sample for quotation.

Write . . . Wire . . . Phone . . .

GENERAL ENGINES CO.

307 HUNTER ST., GLOUCESTER CITY, N. J.

FOR SALE

- 1—Kent #4 Flo Master Mixer
 - 1—FMC Model #12 Batch Mixer
- Both in excellent condition
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BLOCK PLANT — Capacity 1800 blocks daily. In city of 18,000 — no other within 40 miles. Photos and complete information furnished on request. Price \$30,000.00. Might consider \$10,000 cash for partial interest, with privilege of acquiring business later on. 18—all Welded Steel 48 Block Capacity racks and a hand operated 18-concrete brick capacity machine.
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Keokuk Iowa

FOR SALE

BLOCK PLANT, capacity 2,500 blocks daily. With Stearns No. 7 pallets, molds, etc., for 8's and 12's. Powermaster 30 H.P. Steam generator. Lift truck. Next door to fastest growing Washington, D. C. metropolitan area. Price \$37,500. In less than two years you can be clear and rolling free of debt. Box L-32, CONCRETE PRODUCTS, 309 W. Jackson Blvd., Chicago 6, Illinois.

READY-MIX PLANT FOR SALE. LOCATED AT MANCHESTER, IOWA. POSSESSION AT ONCE.

T. A. HENDERSON
MONTICELLO, IOWA

CONCRETE BLOCK MAKING EQUIPMENT FOR SALE. BEST OFFER. BELMONT MATERIAL COMPANY, 76th & CLAREMONT, CHICAGO, ILL. PHONE: REPUBLIC 7-5700.

FOR SALE

Bulk Cement plant, new August 1950. Blaw-Knox Elevator 45 ft. C to C Sprocket. 50 ton per hour. Unloading facilities. Powered Int. I.U. Gas motor. Heltzel cement valve 500 bbl. Cement Storage. 33 bbl. Surge tank. Storage & Surge tank used.
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R.R. #4, Angola, Indiana

FOR SALE

- 1—3 cu. yd. Jaeger mixer mounted on a White truck, Wa-26, 1945 model, single axle.
 - 1—3 cu. yd. Jaeger mixer mounted on a White truck, WB-22, 1946 model, single axle.
- ACME READY MIX CONCRETE CO.
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WANTED Used Block Machines, Mixers, Elevator, Pallets or any other type of concrete equipment, in any kind of condition. Interested in renting sites or space for Block Plants. BOX L-39, CONCRETE PRODUCTS, 309 W. Jackson Blvd., Chicago 6, Ill.

WANTED

Direct factory contacts, building specialties; especially concrete accessories, for our wholesale dept. Write: G. J. MURPHY, 6211 Sexton St., St. Louis 20, Mo.

CONCRETE BRICK COLORS CEMENT COLORS MORTAR COLORS

made by
BLUE RIDGE TALC CO., INC
Henry, Virginia

STOP that WATER

WITH FORMULA NO. 640
A clear liquid—7 different resins in a solvent which penetrates 1" or more into concrete, concrete blocks, stucco, seals, holds (250 psi water pressure. Applies quickly—no mixing—no tarring—no membranes—no cleanup. Use on forms—wood or concrete.
HAYNES PRODUCTS CO., OMAHA 3, NEBR.

FOR SALE

One air seal vault mould.
One box type vault mould.
One large electric cement mixer.
One vault lowering device.
One Dodge vault truck.

Write: **AEILING BURIAL VAULT CO.**
414 W. 8th St., Dover, Ohio

Distributor or Block Plant Operators

Earning possibilities \$25,000.00 or more a year. Selling Nation-Wide reputable HIGH SPEED BLOCK TAMPING MACHINE. Produces superior High Test-Strength Blocks. Has exceptional low water absorption. Big cement savings. Experienced men will assist you in setting up plant. Start your production and plan its merchandising. BOX L-38 CONCRETE PRODUCTS, 309 W. Jackson Blvd., Chicago 6, Ill.

Molds & Parts for Besser Super Vibrapac to make standard units—4", 6", 8", 12" sizes—including stripper shoes and cores to make halves or 15 1/2" lengths—all patterns—sash, halves, double corners, single corners, stretchers, etc. Also 6" bullnose in all patterns. All in good to excellent condition—some new. Complete list on request. **BUCKEYE SAND & SUPPLY COMPANY, BELLAIRE, OHIO.** Phone: Bellaire, Ohio, 1284.

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One 3 yd. Smith and one 3 yd. Ransome mounted on K8 Internationals, in operation daily. Owner purchasing large mixers. Prices very reasonable.

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Lynchburg Virginia

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29—72 block plain pallet racks for use with magnetic off-bearer. Sturdily constructed. Never used. **SMITH CONCRETE PRODUCTS CO., Kinston, N.C.**

WANTED TO BUY!

PRESSED STEEL PALLET

WE BUY COMPLETE BLOCK PLANTS

Write . . . Wire . . . Phone . . .

GENERAL ENGINES CO.
307 Hunter St., Gloucester City, N. J.

WANTED

29 Stearns Jolterete Block Machine complete with power carrier, air off-bearer and turn tables. **BLUE RIDGE FUEL CORP., 1400 MORELAND AVENUE, BALTIMORE 16, MARYLAND.**

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Write for free samples and prices of "LANSCO" CEMENT COLORS produced in 50 attractive shades. Packed in bulk and in 1 lb. and 5 lb. packages.
manufactured by

LANDERS-SEGAL COLOR CO.
73 Delevan St. Brooklyn 31, N. Y.

FREE SERVICE for Buyers

Here is the quick way to get information and prices on machinery and equipment. Just check the item (or items) listed below about which you desire information. Then send this list to us, and we will take care of the rest.



- | | | | |
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| — Aftercoolers, Air | — Coal Pulverizing | — Engineering Service, | — Pulverizers |
| — Aggregates (special) | — Equipment | — Consulting and Designing | — Pumps |
| — Air Compressors | — Concentrating Tables | — Explosives & Dynamite | — Scales |
| — Air Separators | — Concrete Mixers | — Fans & Blowers | — Screen Cloth |
| — Asphalt Mixing Plants | — Concrete Mixing Plants | — Flotation Equipment | — Screens |
| — Bagging Machines | — Concrete Specialty | — Front End Loaders | — Scrubbers: Crushed |
| — Bags | — Molds | — Gasoline Engines | — Stone, Gravel |
| — Barges | — Concrete Waterproofing | — Gear Reducers | — Shovels, Power |
| — Batchers | — and Dampproofing | — Generator Sets | — Speed Reducers |
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| — Belting, V-Type | — Cranes | — Hoists | |
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| — Bodies, Trailer | — Drilling Accessories | | |
| — Brick Machines and | — Drills | | |
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| — Bulldozers | — Equipment & Supplies | | |
| — Cars, Industrial | | | |
| — Classifiers | | | |

If equipment you are in market for is not listed above, write it in the space below.

Send to:

Research Service Department

ROCK PRODUCTS

309 W. Jackson Blvd.

Chicago 6, Illinois

Your Name _____ Title _____

Firm Name _____

Street _____

City _____ State _____

CP-2

GET HIGH EARLY STRENGTH CONCRETE PRODUCTS

*with Standard Cement
plus
Solvay Calcium Chloride*

- Cuts in half curing or protection period
- Produces high early and ultimate strength
- Provides extra cold weather protection
- Includes "built-in" curing
- Permits quicker deliveries
- Lowers your costs

To speed up operations and permit use of products in shorter time — especially in cold weather — add Solvay Calcium Chloride to your Portland Cement mixes. You get better workability, improved appearance, more uniformity and greater economy. In poured products, Solvay Calcium Chloride doubles your output and improves quality. Works equally well with all Portland Cements, including standard, high early, air entrained and low heat cements.

Send for FREE Book Containing Full Details

"How to Get Better Concrete Products at Lower Cost" is filled with important information and answers to your questions about the use of Calcium Chloride in concrete. For your free copy, mail coupon below.



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61 Broadway, New York 6, N. Y.

Please send me, without any obligation, your free book,
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Company.....

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CP-2

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You'll Find The Ideal
Construction and Operational
Features In The ... *New*

KENTWIN BLOCK MACHINE

An Advanced,
Simplified Plain Pallet Machine
Featuring:

AUTOMATIC, CONTINUOUS CYCLING. Makes two 8" blocks or equivalent; or brick each cycle. Will produce all shapes of building block used today.

ONE MASTERBOX. Low cost insert molds are easily interchanged inside.

RUGGEDLY BUILT FOR LONG SERVICE. Liberal size, quality steel members throughout.

SIMPLIFIED HYDRAULIC OPERATION, DIRECT ACTING CYLINDERS. Cams, gearing and levers eliminated for positive, smooth action.

EASY TO CLEAN AFTER DAY'S OPERATION Feed drawer easily removed.

CAN BE EQUIPPED WITH AUTOMATIC PALLET RETURN AND ELECTRO-MAGNETIC OFF-BEARING HOIST. (Not shown in photograph.)

SYNCHRONIZED, DUAL MOTOR VIBRATION READILY ADAPTABLE TO YOUR PALLETS.

POSITIVE BLOCK SIZING WITH ELECTRIC CONTROL.

HEAVY DUTY, ANTI-FRICTION BEARINGS USED THROUGHOUT.

FLOOR LEVEL INSTALLATION, NO PIT REQUIRED.

**Use This Handy Coupon To Get
Complete Information and Prices**



In keeping with our policy of designing and building concrete products machinery best suited to the specific requirements of our friends in the field, we are pleased to announce the New KENTWIN Block Machine.

It incorporates all the important features, improvements and refinements developed during our 27 years of specialization.

The **KENT MACHINE CO.**

CUYAHOGA FALLS, OHIO

Manufacturers of

CONCRETE PRODUCTS MACHINERY SINCE 1925

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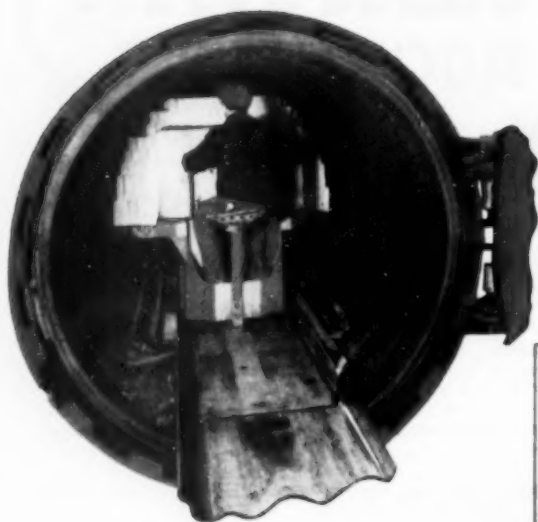
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For concrete block and brick production

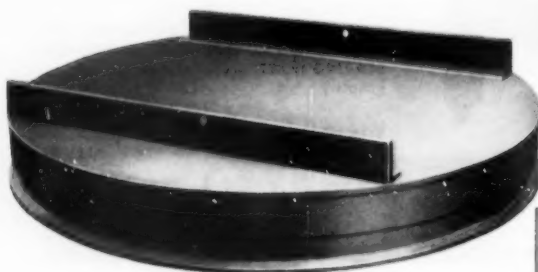
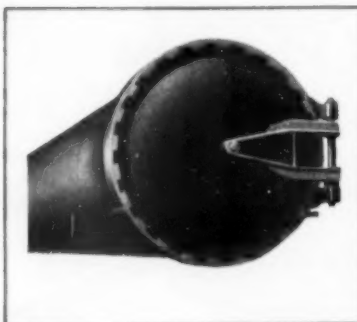
THE RIGHT EQUIPMENT SAVES YOU TIME and MONEY!



J-C HIGH PRESSURE KILN

for fast, efficient curing.

Available in diameters from 6½ to 8 feet; in lengths up to 100 feet. Features the J-C quick operating door, which cuts opening and closing time up to 90%.



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speeds loading at the press or cubing and stockpiling in the yard.

Easy to operate. Rotates on large diameter (6") wheels. Available in table diameters of 5, 6, 7 or 9 feet.



Increase your profits by reducing production time and costs. Write for additional information about Jackson and Church Co. equipment for brick and concrete products.



JACKSON & CHURCH COMPANY, SAGINAW, MICHIGAN
WORK WELL DONE SINCE '81

Here is How...



WHITE EXTRA QUALITY

Really Pays Off!



Here - One of the Whites starts its climb up the sand dune over a newly laid road of loose slag. Hauling 30,000 pounds of slag. Much of grade 30° and more.



Here - Expert touch needed here, lining up vehicle for run down ramp with full load. Uncertain footing and lots of strain but White handles well... keeps coming back for more.

WATCH THE WHITES in action on the extra-rugged jobs for real proof of performance.

Look at the job they're doing for Aalco Express Co., St. Louis, helping to build the new Chain of Rocks canal in the Mississippi river.

Whites are hauling bigger loads... cutting schedule time... making the grades without lugging... because they are engineered to the work they are doing.



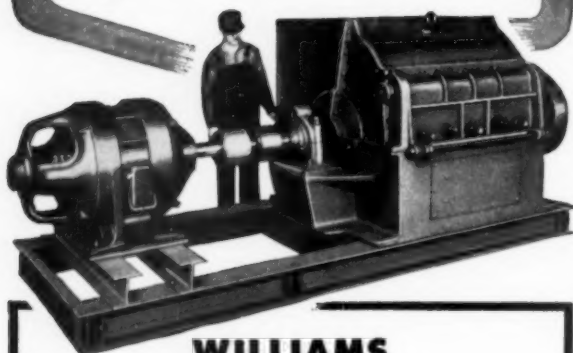
Here - Now the climb off the uneven ramp, on to loose shale. Really rough here. Some trucks started sliding and ended in canal. Others couldn't make steep grade. "Whites ideal for this operation," reports Charles Peters, president of Aalco. Performance proves it.

THE WHITE MOTOR COMPANY • Cleveland 1, Ohio



FOR MORE THAN 50 YEARS THE GREATEST NAME IN TRUCKS

**Only One Operation
To Crush 6" Stone To
Agstone Or Smaller!**



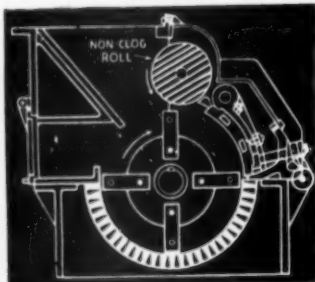
WILLIAMS SECONDARY HAMMER MILLS

For speed and stepped-up output in reducing rock of 6" size to agstone — or down to 20 mesh if required — Williams secondary hammer mills are in a class by themselves! Capacities range up to 75 tons per hour. Hundreds of installations have proved them outstanding profit-makers!

Extremely heavy rib-reinforced construction — manganese steel liners and breaker plates — easy adjustment to compensate for wear — double duty hammers — metal trap for tramp iron — instant access for service — these and many other features make the low cost Williams Hammer Mills top paying investments!

Many Sizes For Any Requirement

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NON-CLOG ROLL MECHANISM

The best way to handle wet, sticky clay or shale direct from pit for quick grinding without clogging. Roll is attached to hopper opening. Can be driven off main pulverizer shaft if desired.

OTHER WILLIAMS EQUIPMENT

ROLLER AND IMPACT MILLS with Air Separation for grinding to 325 mesh or finer . . . HELIX-SEAL MILLS for dustless or wet grinding . . . DRYER MILLS . . . AIR SEPARATORS . . . VIBRATING SCREENS . . . COMPLETE "PACKAGED" PLANTS ready to install.

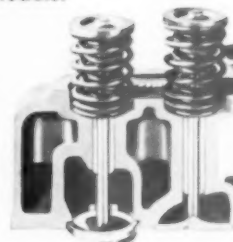
WILLIAMS PATENT CRUSHER & PULVERIZER CO.
800 ST. LOUIS AVE. ST. LOUIS 6, MO.



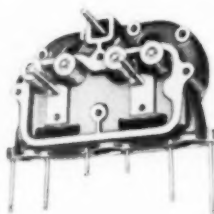
**Why Allis-Chalmers
POWER UNITS
cost less
to operate**



1. Removable cylinder sleeves on all models.



2. Valve-in-head construction.



3. On large engines one interchangeable head to each two cylinders permits one man to make adjustments right on the job.



4. Heavy blocks keep parts in proper alignment.

5. Pressure lubrication to all internal moving parts.

6. Maximum power at moderate speeds.

Parts and Service available from Allis-Chalmers dealers everywhere.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 7, U. S. A.

MODEL	RPM	MAXIMUM BRAKE HP.
B-125	1500	24.3
W-201	1400	33.5
U-318	1200	45.0
E-563	1050	74.0

*you can go
down and
get it 15"
below grade*



*you can go
up and get
it 15 feet
above grade*



**—and do it with CROWD AND HOIST . . .
no wheel traction . . .**

If you are doing excavation work you probably realize the mechanical advantages of big shovels—simultaneous and independent hydraulic crowding and hoisting, variable crowd action at any dipper position, changeable buckets, etc. But, do you know all these advantages have been engineered into the Dempster-Diggster to give you a faster, more versatile excavator, on pneumatic tires with a 1 cu. yd. capacity. In addition the Dempster-Diggster does anything a conventional front end loader can do—and does it faster at less cost with its 1½ or 2 cu. yd. bucket. In excavation the Dempster-Diggster is without equal for working in tight places . . . dumps at 11'3" height . . . travels at truck speeds from job to job. The versatile Dempster-Diggster is a fast, power-packed excavator and loader you can't afford to be without! Write today for our new catalog No. 1032. A product of Dempster Brothers, Inc.



DEMPSTER BROTHERS, 323 N. KNOX, KNOXVILLE 17, TENNESSEE



STONE AND
WOOD GRABS
CLAMSHELL
DRAGLINE
CUSTOM-BUILT
BUCKETS

WELLMAN

EASY HANDLING OF LARGE STONES

● Those big stones won't slip from the Wellman Stone Grab. Four-part closing cable reeving develops tremendous closing force on stones. Model shown has 5-ton capacity, 4½ foot jaw spread. Other capacities available.

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7000 Central Avenue
Cleveland 4, Ohio

New and Better Diamond Bits for Modern High-Speed Drilling

For a number of years we have been working on the development of new types of diamond bits, to supplement our well-known "TRUCAST" bits, which are still unsurpassed for many drilling requirements. NOW, after having been thoroughly proved by our contract drilling crews, under every variety of drill-

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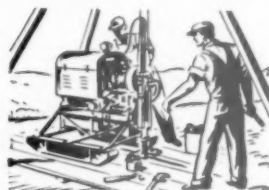


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To get the full benefit of our new diamond bits you need drilling machines with plenty of power and a wide range of both speed and feed. Model 40-C is our latest-model core-drilling machine and can be relied upon for best possible all-round results on holes up to 1000 feet in depth. Other modern machines provide for very deep core drilling and for either core drilling or blast-hole drilling underground. We also manufacture a complete line of improved accessory equipment. Illustrated bulletins containing detailed information mailed on request.

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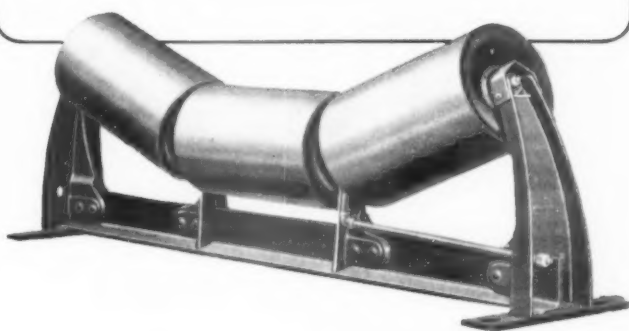
We do drilling by contract and are one of the oldest and largest contractors for any type of core drilling. Experienced crews are available at all times for service anywhere in the world. Estimates submitted promptly.



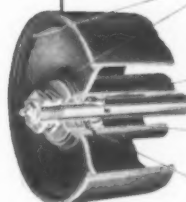
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Branch Offices: NEW YORK • PHILADELPHIA • PITTSBURGH

Why LINK-BELT IDLERS require minimum lubrication and adjustment



CUTAWAY OF "100" ROLL



Concentrically counterbored and journaled full-length central tube and counterbored roll shell are continuously welded to dished heads to maintain balance and bearing alignment.

Precision roller bearings maintain alignment.

Large grease reservoir prolongs lubrication intervals.

Grease-in-dirt-out, cartridge type unit seal preserves lubricant. No springs, no loose parts, no sliding metal-to-metal contact.

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And, because of standardized design, Link-Belt gives you the famous "100" Idler or the heavy-duty "200" Idler at a cost lower than you'd expect. You can choose from the full Link-Belt line of troughing, impact-cushioning, belt training and flat belt idlers in a wide range of roll diameters and belt widths. A complete line to meet any requirement.

Remember, too, Link-Belt offers a complete line of other belt conveyor components—all types and sizes of take-ups, pulleys, trippers, back-stops and drives. Coupled with our broad belt conveyor engineering experience, this assures you of the right equipment for your handling requirement.

LINK-BELT
ROLLER BEARING IDLERS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal Cities. 32,541

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LULL Shovel loaders do scores of quarry jobs faster and easier.

Low investment and low operating cost, plus Lull's top design features give you lower cost gravel and aggregate handling. Loads hoppers, bins, and trucks. Moves, piles, mixes and cleans up. Fits into all types of pit operations to give you faster and better handling. Bucket capacities from $\frac{3}{8}$ to 1 cu. yd.—lifting capacities from 1,800 to 6,000 lbs. Models to fit your every job. Lull Shovel loaders mount exclusively on the dependable Case, Minneapolis-Moline, Oliver and Sheppard industrial wheel-type tractors. Contact these industrial tractor distributors for complete information or mail the coupon today.

Lull Manufacturing Company
382 West 90th Street, Minneapolis 20, Minnesota

Mail me your 10 page catalog which shows Shovel loader uses, attachments and complete specifications.

Name _____
Firm _____
Address _____
City _____ State _____



Manufacturing Company
382 West 90th Street • Minneapolis, Minn.



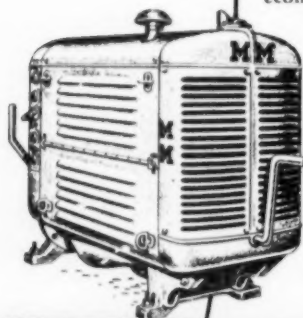
INDUSTRIAL WHEELERS *Cut* HANDLING COSTS



Roll back loading costs with the new UTIL Shuttle Wheeler! A new shuttle gear gives 6 reverse speeds at 85% of the 6 forward speeds (1.8 to 14.5 m. p. h.). Since loader operation is 50% forward and 50% reverse travel, UTIL *fast reverse speeds* and *quick change* from forward to reverse gear cut time on every load!

MM Roller Spin Steering permits steering wheel to roll easy with capacity loads. Heavy-duty front-end 10,000 lb. tire capacity and engineered design *minimizes road shock* and operator fatigue.

See Your MM
Dealer-Distributor
or Write



MM INDUSTRIAL POWER UNITS for hoists, electric generators, rock crushers, pumps, compressors, cranes, shovels, and many other industrial uses give excellent performance and economy... *proved adaptability!*

- High-turbulence combustion chamber!
- Controlled cooling!
- Exclusive MM Heat Exchanger Base Panel
- Oil pressure and water temperature safety cutouts!
- Removable cylinder heads and blocks!

From 25 to 230 h.p.

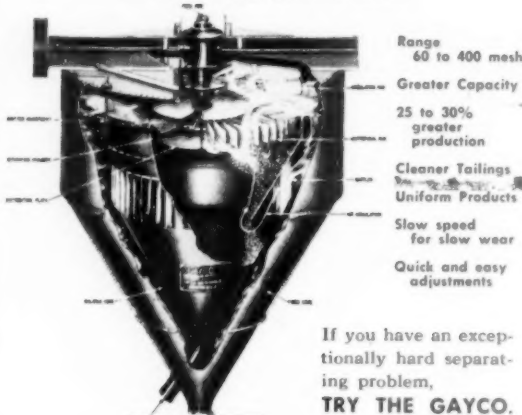
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POWER IMPLEMENT COMPANY
MINNEAPOLIS 1, MINNESOTA

GAYCO CENTRIFUGAL SEPARATORS

GAYCO Separators, equipped with the adjustable centrifugal sizing fan — an exclusive GAYCO feature — make closer separations. Closer separations bring about higher production through efficient removal of the fines made by the mill. Closer separations bring about higher quality products by eliminating all undesirable oversize.

"TIMKEN BEARING EQUIPPED"

GAYCO brings you all these:



UNIVERSAL ROAD MACHINERY CO.

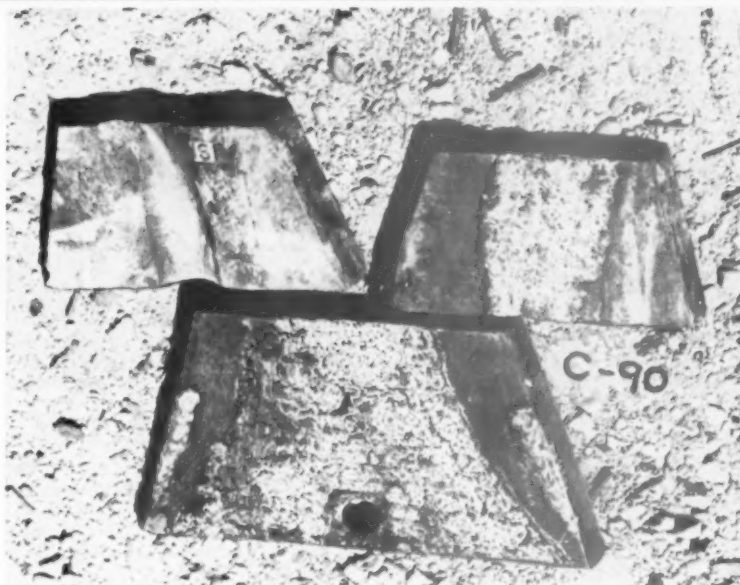
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QUINN WIRE & IRON WORKS 1603 12TH ST. BOONE, IOWA

Rebuild Cheek Plates with **N. M. MANGATONE**

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Here is an opportunity to put the finger on another of those little expenses which add up during the year.

Call this to the attention of our field man and he can show you how to cut this expense **SQUARELY IN HALF.**

RESISTO-LOY CO. Manufacturers
GRAND RAPIDS 7, MICHIGAN

HETHERINGTON & BERNER

DREDGING PUMPS



performance-proven on the toughest jobs

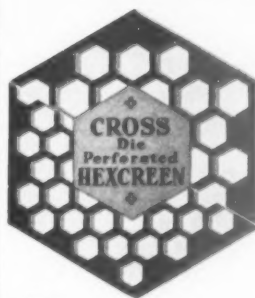


Hetherington & Berner sand and gravel pumps are available in two general types: *STANDARD*, (4", 6" and 8" sizes) with semi-steel parts, for ordinary working conditions and moderate heads; and *DREADNAUGHT*, (6", 8", 10", 12" and 15" sizes) with manganese steel parts, for heavy duty jobs with stringent head conditions.

Write for Bulletin DP-147.

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"CROSS" LEADS THE WAY IN ANY HEAVY DUTY SCREENING PROBLEMS



"CROSS" ROUND SQUARE OR HEXCREEN PERFORATED STEEL PLATES AND SECTIONS PROVIDE TOP PERFORMANCE AT ALL TIMES

For

- VIBRATING
- SHAKING
- REVOLVING Screens

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Look for this Stamp on all "Cross" Products



the Sign of PLUS QUALITY for PLUS PERFORMANCE

CROSS ENGINEERING COMPANY

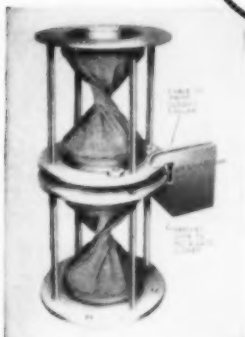
Manufacturers • Carbondale, Pennsylvania • Telephone: 300

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S-A

for handling
ROCK PRODUCTS
at **ROCK-BOTTOM COST**

for EXAMPLE....



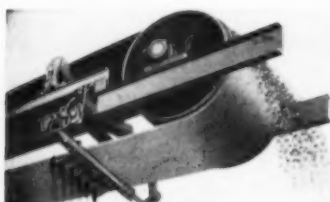
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For dust-tight, dribble-proof bin flow control of both lump and fine materials. Rubber sleeves twist for a tight seal, by means of either hand or motor control, local or remote. When gate is open the two rubber sections, joined by a rotating collar, allow free flow. Write for Bulletin 254-A.



S-A BELT CONVEYORS

Engineered and built to withstand heavy duty service in moving large volumes of materials at low cost per ton. Available in a wide variety of sizes and arrangements—to meet specific operating conditions. Ask an S-A engineer for full details, or write for Catalog 146.

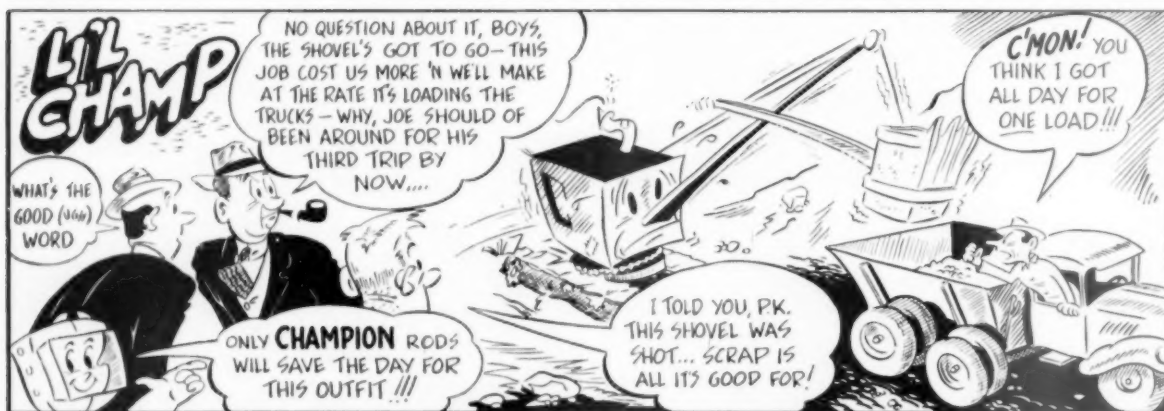


CONVEYOR BELT CLEANER

Pays for itself by prolonging belt life. Removes wet or dry material, leaving surface of belt clean and dry. Installs easily on any belt conveyor. No moving parts—no power is required. Write for Bulletin 651.

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DESIGNERS AND MANUFACTURERS OF ALL TYPES
OF BULK MATERIALS HANDLING EQUIPMENT



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WOVEN WIRE SCREENS
ACCURATE • DURABLE • ECONOMICAL

The reliability of T.C. Alloy Screens has carried them into all parts of the world. Made in Standard and Special Weaves, with Square or Oblong Openings — from 10 mesh, .035" wire on up. Write today for Catalog No. 42.

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Slurries...handled at lower cost

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- 1 D. C. Control Panel
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- 1 Separately Mounted Synchronous Motor Exciter
- 1 Cutler Hammer Automatic Reduced Voltage Starter & G. E. Circuit Breaker
- 1 D.C. Control Panel with Rheostat, Breaker & Instruments
- 1 G. E. 12 K.W.—125 Volt—1800 RPM Motor Generator Set for Braking Cars
- 1 A.C. & D.C. Control Panel with Starter, D.C. Breaker, Rheostat & Instruments.
- 2 D.C. Feeder Panels with 4 ITE Breakers, 4—1200 Ampere Switches, Wattmeter & Voltmeter.
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- 1 Station of Woodford Haulage System Control Equipment Mounted on Panels, Consoles & Racks Consisting of: 40 D.C. 250 V, 300 Ampere Contactors, 5 ITE Breakers, 6 S.P.S.T. Knife Switches, 3 Banks of Grid Resistors, 2 Woodford Resistors, 2 D.C. Ammeters, 1 Bank of 11 Lever Controllers and 2 Banks of 19 S.P.D.T. Trip Controllers.
- 5 10 Cu. Yd. Standard Gauge, Steel Frame, Wood Box Quarry Cars with 2—35 H.P., D.C., 250 Volt Allis Chalmers Motors & Electric Brakes
- 10 Quarry Cars, Same as Above Except with Steel Box and 2—50 H.P. D.C. Motors.
- 2 Miles (Approximately) of Standard Gauge Track Consisting of:
 - 350 Tons of 60 & 70 Lb. Relay Rail
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Nos. 9, 8, 7½ and 6K Allis-Chalmers gyratory crushers.
1—6' Raymond Whizzer separator.
1—36"x16" Sturtevant crushing rolls.
1—42"x16" and 12"x12½" Allis-Chalmers crushing rolls.
1—24"x14" Rogers Crushing Rolls.
1—800-1200 or 1500 barrel cement plant.
5' x 50' x ½" dryer. 1—8'x80' kiln.
New and Rebuilt Dryers—Kilns and Coolers.
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50 Broad St., N.Y. Tel. Wh. 4-4236

2880 Jr. Gravelmaster CR2 unit 100 TPH Crushing. 75 TPH Washing PLANTS.
CRUSHERS: 9x16 Univ. 10x30 & 10x40 Champion 15x36 Gruender, 18x36 Cr. 24x36 Lippman 30x42 Univ. 48x36 Farrell JAW. 25 & 37 Kennedy, 10B, 12B, 16B, & 20A Teismith. 10x14 McCully. 7 & 10" Newhouse OYR. 2' & 4' Symons CONE.
6-8'x50' Rotary Kiln, ½" shell. Excell.
MILLS: Williams 4 & 5, Gruender 2XC, 3XB, Williams Comet Roll. 6x8 & 6x8 Ball. 5x10 Rod.
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SHOVELS: Bay City 25, Bucyrus 70, Link Belt L875, NW25, 6, 78 & 80D. Bucyrus 37B, 54B & 80H
45 ton GE Diesel Elec. Locomotive.
20 ton Brownhoist 8-wheel Steam Loco. Crane. H&B PA20 all elec. 2000# Asphalt Plant.
400 HP GE Slip Ring Motor 350 RPM 440V.
MID-CONTINENT EQUIPMENT CO. INC.
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BARBER-GREENE LOADERS
82A-3 yd; 552-2 yd., 522-1½ yd.
Haiss 75C—3 yd.

BARBER-GREENE-EBERSOL
9x40 Two Stage Jaw Crusher.

CEDARAPIDS 9 x 36 JAW CRUSHER

THE MC LEAN COMPANY
3525 Lakeside Avenue, Cleveland 14, Ohio

IT'S THE COMPANY BEHIND THE MACHINE THAT COUNTS

Our 36th Year

ROTARY KILNS:

- 3-7'x60', 3/4" shells, Timken bearing supporting rolls, firing hoods, gear reducer and motor driven.
- 2-6'x60', Bonnot Co., complete. 1/2" shells, each with or without 3'x50' Rotary Cooler. By installing lifting flights these kilns would make excellent heavy duty dryers.
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- 3-3'x50', 5x30', 5x50', 6x60', 7x70' Direct Heat. Also 3- 6'x50' Louisville Rotary Steam Tube.

CRUSHERS:

- Jaw-2'x6", 6"x15" Sturtevant; 18x36" and 24x36" Farrel; 42x48" Traylor.
- Rolls: 42"x16" Allis-Chalmers Type B; 24x32" Penna. single roll.
- Portable Plants-Cedar Rapids 1036-BBB; 2540-AAAA, 2936-AAA, also Pioneer with 30x42" primary and secondary crushers, all Diesel driven.

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- 1-5 roll Raymond High Side.
- 6-#1, #0, #00, #000 Raymond Mills.
- 3-#0, #00, 8" Raymond Screen Mills.
- 2-#51 Raymond Imp Mills.
- 2-Mikro #2TH, #4TH.

BALL AND TUBE MILLS:

- 1-4'6"x7' Allis-Chalmers Ball Granulator, iron lined, used 100 hours.
- 6-Harding Mills, 3'x8", 5'x22", 6'x22", 8'x48".
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- 1-1030 Good Roads Overhead Eccentric Crusher.
- 1-6" x 9" New Holland Jaw Crusher.
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CONE TYPE: Symons 2, 3, 4 and 5 1/2". No. 80 Teilmith. Also Kennedy 19, 25, 27 and 40. Traylor 13" and 2 1/2" T.Y. Newhouse 7, 10 and 14". Stedman 24, 30 and 36" Impact. Allis-Chalmers T.Y. R.
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1	24"	45'	2062	1085
1	24"	100'	4097	2037
1	30"	25'	1421	806
1	30"	65'	3161	1583
1	30"	125'	5621	2748
1	36"	40'	2182	1222
1	36"	75'	3757	2033
1	36"	135'	5107	2616
1	48"	40'	2609	1426

Note: All belting in 4 ply, 28 oz. duck belt with 1 1/2" top rubber cover and 1 3/2" bottom cover.

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Feeders:
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Vibrating Screens:
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Conveyor Belting:
Famous brands at deep cut prices.
Width Ply Top Bottom Duck Canvas Price
18" 4 1 1/8" 1 3/2" 28 oz. 2.20/ft.
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30" 4 1 1/8" 1 3/2" 28 oz. 3.97/ft.
36" 4 1 1/8" 1 3/2" 28 oz. 4.70/ft.
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Raymond High Side 4 roll Pulverizer, No. 8047
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FARREL BACON 36" x 48" Jaw Crusher.
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Port. Erie Strayer concrete plant 30-40 TPH

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NEW F-8 400 bbl. cement bin complete.

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Cedar Rapids 10x36 Portable Diesel power
Pioneer 40-V. New 1946. Portable. Diesel power
Pioneer Portable 21x36 Diesel power.
Teilmith Primary Port. 25'x35" jaw crusher Diesel.
Pioneer Secondary Plant. Port. 100 T.P.H. 1 1/2".

CRUSHERS

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Cedar Rapids 10x20, 20x20, 25x40. Farrell 10x20, 12x30, 14x36, 18x36, 20x40. Buchanan 30x42.
Good Roads Helland 15x30. Traylor 18x36, 24x36.
Allis-Chalmers 30x18. Good Roads 10x30. Teilmith 18x32. Champion 10x30 1040, 1235, 1536.
GYRATORY: Allis-Chalmers McCully 6", 7 1/2", 8", 9", 12K, 20", 30", 42", 14", Newhouse 24", 36", Gyrsphere, 18", 28". Intercone Teilmith, Teilmith 511, 10-B, 15-B, 16-B. Kenmore Van Saut 7, 10, 25 1/2, 37. Traylor Tr 18", Tr 24", T-41 1/2".
ROLL: Allis-Chalmers 54x24. Diamond 40x22. Pioneer 30x18. Teilmith 24x16. Pioneer 30"x18". New Holland 24x16.

HAMMERMILL: Size 4 Williams Jumbo. Pennsylvania 8X2, 22x22. Cedar Rapids 20x33. Jeffrey 30x42. Jeffrey 30x42, 36x42. Dittie 36x0.

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Lorain L80 Shovel. 1 1/2 yd. complete overhaul.
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See double deck 1'x14".
A-C 5'x14" double deck Ripple-Flo screen
Symons 1'x14" double deck
Acme 5'x12" Revolver. Scrub-Scalp Screen.
A-C 5'x14" 2 deck ripple-flo.
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Teilmith 4'x7" recip. plate feeder

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2 Cat. D8 angleboilers with DDPC Reel-Guar.
3 Cat. D7 angleboilers with DDPC Reel-Guar.
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1—4'x20', 2—4'x45', 1—4'x80'
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48 x 60 SUPERIOR JAW CRUSHER.
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Henderson-Cyclone No. 42 well drill, new.
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45" Ohio lifting magnet, rebuilt.

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60 CFM, new condition.

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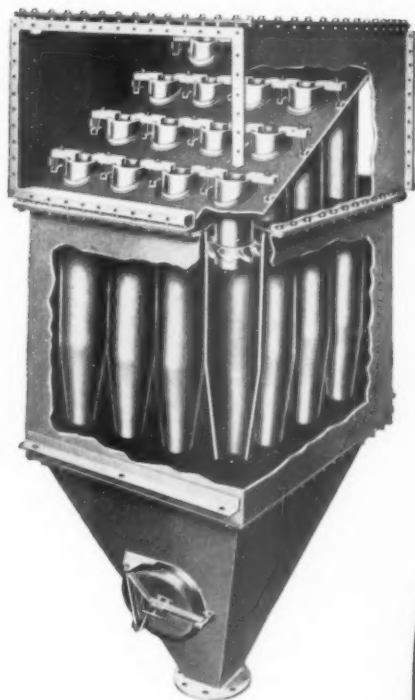
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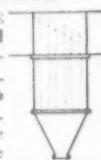
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Finest for rolling big loads faster on all free-rolling wheels.

SURE-GRIP

Top tire for traction on any rig where PULL is the prime need.

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Super-tough champ for front wheels on all tire-killing work.



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